

Knowledge and Attitudes Regarding Crimean-Congo Hemorrhagic Fever Among Slaughterhouse Workers in Sana'a and Dhamar Cities-Yemen: A Cross-Sectional Study

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Background: Crimean-Congo Hemorrhagic Fever (CCHF) is a viral infection spread through tick bites or contact with secretions from infected animals or humans, posing a risk to slaughterhouse workers. This study aimed to evaluate the knowledge and attitudes of slaughterhouse workers in Yemen towards CCHF.

Methods: A cross-sectional study conducted on 173 adults working at slaughterhouses in Sana'a and Dhamar cities, Yemen using a multi-stage sampling. The questionnaire used in the study was a reliable survey instrument (with a Cronbach's alpha coefficient of 0.71) employed for the purpose of data collection. The questionnaire encompassed three distinct sections: 1)- demographic inquiries pertaining to age, gender, marital status, level of education, and occupation; 2)- knowledge-based inquiries consisting of 27 items; 3)- the attitude section consisted of 11 questions. After completing the questionnaire, the data were analyzed by SPSS version 24, using percentages, chi-square test, and Spearman correlation coefficient.

Results: The mean age of the participants was 30.6 years with a SD of 11.2 years, with 84.4% male and 15.6% female. Most slaughterhouse workers were butchers (78.6%) and some were shepherds (21.4%). The participants had poor knowledge (86.7%) and attitude (72.3%) towards CCHF. There exists a noteworthy association between the knowledge scores and the gender, education level, and occupation ($P=0.035$, $P=0.039$, $P=0.001$). A significant positive correlation was identified between knowledge and attitude scores ($r = 0.715$, $P<0.001$).

Conclusion: The majority of respondents had poor knowledge of CCHF. Educational programs are essential for increasing community awareness, with involvement of technical experts crucial for disseminating information on preventing and managing CCHF.

Keywords: CCHF, slaughterhouse workers, knowledge, attitude

Introduction

CCHF is a disease that can be transmitted from animals to humans, caused by the CCHF virus, which belongs to the *Nairovirus* genus in the *Bunyaviridae* family.¹ This illness has received considerable attention due to its relatively high mortality rate, especially when certain risk factors are present.² In Iran, CCHF is an endemic disease, with a notable

prevalence in the southeastern part of the country. Since 1999, there have been significant outbreaks of this disease during the spring and summer seasons.³

This lethal viral infection has been documented in various regions of Africa, Asia, Eastern Europe, and the Middle East.^{4,5} CCHF is transmitted to both large and small mammals, as well as birds, through adult ticks.⁵ The main carriers of the CCHF virus are ticks belonging to the *Hyalomma* genus. Young ticks become infected with the virus while feeding on infected animals and remain infected as they grow.⁶ Once mature, these ticks can pass on the infection to domesticated animals. Infected sheep, goats, and cattle may have high levels of the virus in their blood but usually show no symptoms. It has also been observed that the virus can be passed from one generation of ticks to another, with ostriches being an exception to the general immunity seen in birds.⁷

Humans can become infected with the virus through tick bites, direct contact with fresh meat or blood from animals showing viremia, or direct contact to the blood or secretions of an infected individual.⁸ Animals typically exhibit viremia about a week after infection, manifesting as a mild to moderate fever that is often unnoticed. It seems that humans are the only vertebrate species that experience severe and frequently fatal illness as a result of the CCHF virus. Sheep and goats, due to their close interaction with humans, are the primary domestic animals vulnerable to this virus.^{9,10}

Humans have the potential to acquire infection through direct contact with the skin, consumption of undercooked or raw meat, or the ingestion of unpasteurized milk. In a few instances in Russia, aerosol transmission has been documented.¹¹ Transmission of the disease from person to person can also happen, especially when the skin or mucous membranes come into contact with infected blood or secretions.¹² Butchers have a higher probability of having antibodies for CCHF compared to individuals in other professions. The risk of getting infected is increased by frequent contact with infected animals. Occupations involving regular contact with animals or animal-derived products, such as livestock handlers, skin processors, veterinary staff, workers in livestock markets, and other related personnel, are at a higher risk of infection.^{12,13}

The duration of the incubation period is contingent upon the method by which the virus is transmitted. In instances where the infection is facilitated by a tick bite, the incubation period typically spans a range of one to five days. Conversely, when contact is made with contaminated blood or tissues, the incubation period typically extends from 5 to 7 days, although there have been documented cases where it lasted up to 13 days.^{7,14}

The initial indications of illness are non-specific, as seen in the prehemorrhagic phase. Subsequently, the hemorrhagic phase manifests with the appearance of a petechial rash on the skin, conjunctiva, and various mucous membranes, eventually leading to bleeding from the gastrointestinal and urinary tracts. It is not uncommon to observe hepatomegaly and splenomegaly. In the event of hemorrhaging, the occurrence of multiorgan failure and shock cannot be disregarded.⁷

The CCHF virus was first recognized in Crimea, a region situated in southeastern Europe along the northern shore of the Black Sea, following the Nazi occupation in the mid-1940s. It was subsequently termed as Crimean hemorrhagic fever.^{14,15} Later on, it was detected in Congo in 1969, thus resulting in the naming of the illness. Currently, CCHF is widespread in numerous countries across Africa, Europe, and Asia.¹⁶

During the 43-year period, 321 cases of CCHF were reported from 9/22 Arab countries, Iraq, Kuwait, UAE, Saudi Arabia, Oman, Sudan, Egypt, Tunisia, and Mauritania.

An occurrence of CCHF was observed in the western region of Saudi Arabia between 1989 and 1990.¹⁷ The virus was believed to have been introduced to the country via ticks infesting imported livestock like sheep, cattle, camels, goats, and buffaloes that arrived at the Jeddah seaport. Exposure to the blood or tissues of these animals in abattoirs was identified as a major risk factor, rather than tick bites.¹⁷ A serosurvey conducted in 1997 revealed a high prevalence of CCHF antibodies in Sudanese small ruminants among all imported livestock, with a rate of 4.25%.¹⁸

CCHF is linked to the practice of scarification observed during the Eid-al-Adha festivities, combined with insufficient oversight of livestock movement within and between countries.¹⁹ A total of 57 studies conducted between 1978 and 2021 identified 20 tick species potentially linked to the transmission of CCHFV, with 321 reported cases of CCHF across 9 Arab countries over a 43-year period, showing a mean case fatality rate of 29%. Those at highest risk included individuals in abattoirs, livestock farms, and healthcare settings, primarily through contact with infected animals and patients, with camels having the highest seroprevalence at 29%, followed by cattle, goats, and sheep.²⁰

Despite the close proximity of Yemen, Saudi Arabia, and the African Horn, there have been no reported cases of CCHF in Yemen. The primary objective of this investigation was to appraise the level of knowledge, and attitude of slaughterhouse workers regarding to CCHF in Sana'a and Dhamar cities, Yemen.

Methods

Study Design and Setting

The enrollees of this cross-sectional study were recruited from all the slaughterhouses in Sana'a and Dhamar cities, Yemen, throughout the months of June and December in the year 2020. These urban centers are located in the northern part of Yemen.

Sample Size

The study included 173 slaughterhouse workers, chosen from a total worker of 316, with 128 participants from Sana'a City and 45 from Dhamar City, following the guidelines of the Bukhari sample size calculator 2020.

Sampling and Collection Method

A multi-stage sampling method was utilized to select the establishments for this study. At the outset, every city was viewed as a distinct stratum. Following this, each city was further divided into four strata, and a suitable number of participants were selected from each stratum. In total, 173 employees working in slaughterhouses in these cities were interviewed about CCHF.

The interviewers conducted visits to each slaughterhouse in the study area, explaining the research objectives to all eligible adult individuals who fulfilled the inclusion criteria. These criteria encompassed a willingness to participate in the survey, residency in either Sana'a or Dhamar cities for a minimum duration of six months, and being above 18 years of age. Individuals with severe physical or mental disabilities impeding their ability to partake in the study were excluded.

The interviewers visited every slaughterhouse in the designated area, informing all qualified adults who met the specific criteria of the study's goals. These conditions included a readiness to engage in the survey, living in either Sana'a or Dhamar cities for at least six months, and being over 18 years old. Those with severe physical or mental limitations that hindered their participation were not included in the study.

The research employed a questionnaire as the primary instrument. The questionnaire encompassed three distinct sections: 1)- demographic inquiries pertaining to age, sex, educational background, marital status and occupation; 2)- knowledge-based inquiries consisting of 27 items aimed at assessing the knowledge of the target population, including their familiarity with the mode of transmission, the risk groups associated with tick bites, and the symptoms of the disease. Each item within this section featured a single correct option, accompanied by incorrect alternatives. Selecting the correct option yielded two scores, while responding with "I don't know" was awarded one score, and choosing an incorrect option held no scoring value. 3)- The attitude portion included 11 questions, with each item being rated on a 5-point Likert scale ranging from 1 (strongly disagree) to 5 (strongly agree).

Data Analysis

The data was analyzed using the SPSS version 24 statistical software package from Chicago, IL. Numeric, percentage, and mean data were gathered to assess the knowledge and attitude of participants towards CCHF. Chi-square tests were employed to explore the significant relationship between respondents' demographic characteristics and their knowledge and attitude. A significance level of $p < 0.05$ was utilized. Additionally, Spearman correlation tests were conducted to identify any significant correlation between knowledge and attitude scores.

Results

Socio-Demographic Characteristics

A total of 173 participants were included in the final analysis. The average age of the participants was 30.6 ± 11.2 SD years. The majority, 84.4%, were male, while 15.6% were female, had ages ranging from 18–60 years. Approximately 78.6% of

the participants were employed as butchers in the slaughterhouse, while 21.4% worked as shepherds. In terms of marital status, approximately 23.7% were married, 66.5% were single, and 9.8% were widows or widowers. When considering the participants' educational background, 61.8% were literate, while 38.2% were illiterate (as shown in Table 1).

Knowledge Regarding CCHF

Among the study participants, 12.7% claimed to have prior knowledge about CCHF. Additionally, 13.9% stated that they acquired information about CCHF from radio and television sources. A small portion of the participants, 6.9%, demonstrated awareness of the causative agent of CCHF. General knowledge information regarding the tick reveals that 29.5% of the participants reported that their respective region presented a higher risk for tick bites. Furthermore, 36.4% of the participants claimed to possess the ability to identify ticks, while 17.9% stated that they were capable of recognizing tick bites. Conversely, 17.2% of the participants in the study expressed the belief that not all tick bites lead to disease, and 31.2% acknowledged having been bitten by ticks or having relatives who experienced such bites. In addition, 5.8% of respondents indicated that CCHF is a fatal illness, 22% asserted that CCHF can be transmitted among humans, and 25.4% acknowledged that it can be transmitted from animals to humans. This information is presented in Table 2.

The participants' responses regarding the symptoms of CCHF indicated that fever, fatigue, myalgia, headache, fatigue-low appetite, and all were cited as symptoms of CCHF by 35.3%, 34.7%, 29.5%, 30.6%, and 26% of the participants, respectively. In relation to the symptoms following a tick bite of CCHF, 19.1%, 8.1%, and 13.3% reported that the symptoms appeared within 1–3 days, at least 9 days, and longer than 1 month, respectively (Table 2).

In terms of the participants' perceptions of the risk group for tick bites, 41% identified farmers and shepherds as the at-risk group, while 39.9% believed that people visiting rural areas were at high risk. Additionally, 32.1% stated that healthcare workers were a risky group, but 30.6% of the participants believed that all groups were at risk for tick bites.

Attitude Regarding CCHF

Regarding protective measures against tick bites, approximately 34.1%, 30.6%, 28.9%, 25.4%, and 20.8% of the participants mentioned wearing clothes that cover the entire body, minimizing exposed areas, avoiding touching ticks with bare hands, wearing gloves and other protective materials, and using insecticide, respectively. (Table 3)

Table 1 Socio-Demographical Features of the Participants (No. 173)

| Characteristics | Frequency | (no.) % |
|--|-----------|---------|
| Gender | | |
| Male | 146 | 84.4 |
| Female | 27 | 15.6 |
| Marital status | | |
| Married | 41 | 23.7 |
| Single | 115 | 66.5 |
| Widow/widower | 17 | 9.8 |
| Educational status | | |
| Literate | 107 | 61.8 |
| Illiterate | 66 | 38.2 |
| Occupation | | |
| Butchers | 136 | 78.6 |
| Shepherds | 37 | 21.4 |
| Age (Mean \pmSD) (30.6 \pm11.2) | | |
| 18–29 | 94 | 54.3 |
| 30–40 | 44 | 25.4 |
| 41–60 | 35 | 20.3 |

Table 2 Frequency Distribution of Knowledge Towards CCHF (n=173)

| Question | Correct answer | % |
|---|----------------|------|
| General knowledge | | |
| I have information about CCHF (Crimean Congo hemorrhagic fever) | 22 | 12.7 |
| I learned about CCHF from the radio or television | 24 | 13.9 |
| Relative bitten by ticks | 54 | 31.2 |
| Our region is at risk for tick bites | 51 | 29.5 |
| I can recognize ticks | 63 | 36.4 |
| I know when I have been bitten by a tick | 31 | 17.9 |
| Not all tick bites cause disease | 22 | 17.2 |
| The causative agent is a virus | 12 | 6.9 |
| CCHF is a fatal disease | 9 | 5.2 |
| CCHF is transmitted by tick bite to humans | 50 | 28.9 |
| CCHF is transmitted from human to human | 38 | 22 |
| CCHF is transmitted from animals to humans | 44 | 25.4 |
| Symptoms of CCHF | | |
| Fever | 61 | 35.3 |
| Myalgia | 60 | 34.7 |
| Headache | 51 | 29.5 |
| Fatigue- Low appetite | 53 | 30.6 |
| All | 45 | 26 |
| Risk groups for tick bites | | |
| Farmers- Shepherds | 71 | 41 |
| Healthcare workers | 54 | 31.2 |
| People who are visiting rural area | 69 | 39.9 |
| ALL | 53 | 30.6 |
| Symptoms appear after tick bite | | |
| Within 1–3 days | 33 | 19.1 |
| At least 9 days | 14 | 8.1 |
| Longer than 1 month | 23 | 13.3 |
| Season which CCHF is common | | |
| Spring | 11 | 6.4 |
| Summer | 38 | 22 |
| Autumn | 14 | 8.1 |

Table 3 Frequency Distribution of Attitude Towards CCHF (n=173)

| Question | Correct Answer | % |
|---|----------------|------|
| Protection from tick bites | | |
| Insecticide | 36 | 20.8 |
| Wear clothes covering the whole body | 59 | 34.1 |
| Ticks should not be touched with bare hands | 50 | 28.9 |
| Minimizing the open area of the body | 53 | 30.6 |
| Wearing gloves and other protection materials | 44 | 25.4 |
| The state of information in case of tick bite | | |
| If bitten by a tick, it is necessary to go to a health center immediately | 57 | 32.9 |
| Ticks should be removed with either tweezers or forceps | 49 | 28.3 |
| Ticks should not be killed by squeezing or crushing | 44 | 25.4 |
| After tick removal the bite should be cleaned with soapy water and alcohol or cologne | 57 | 32.9 |
| Is there a treatment for CCHF? | 21 | 12.1 |
| Is there a vaccine against CCHF? | 36 | 20.8 |

Furthermore, when asked about protective measures in case of a tick bite, 32.9% of the participants emphasized the importance of seeking immediate medical care and cleaning the bite with soapy water, alcohol, or cologne after tick removal. Additionally, 28.3% stressed the necessity of removing the tick with tweezers or forceps, while 25.4% reported that the tick should not be killed by squeezing or crushing. Regarding treatment and vaccination against CCHF, $\geq 80\%$ of the participants either believed that there was a treatment and vaccination available or expressed uncertainty on the matter. (Table 3)

Figure 1 illustrates the comprehensive knowledge scores of the participants regarding CCHF. A significant proportion of the participants in Sana'a city, specifically 109 individuals (85.2%), demonstrated a "Poor" knowledge score. Conversely, in Dhamar city, 41 participants (91.1%) were found to have a "Poor" knowledge score. In terms of a "good" knowledge score, 19 individuals (14.8%) in Sana'a city and 4 individuals (8.9%) in Dhamar city were observed. The overall, 86.7% (n = 150) participants have poor knowledge of CCHF, while 13.3% (n = 23) have good knowledge (Figure 1)

Table 4 illustrates the knowledge score of the participants regarding CCHF with Socio-demographic Variables. There was a noteworthy association observed between the Knowledge scores of the Participants and gender, educational level, and occupation ($P=0.035$, $P=0.039$, $P=0.001$), respectively, while no association was found between Knowledge scores and age and marital status ($P=0.905$, $P=0.855$). (Table 4)

The study participants demonstrated a correlation between their responses categorized as either good or poor in relation to their scores on knowledge and attitudes, with 81.7% scoring poorly and 78.9% scoring good. A significant positive correlation was identified between the knowledge and attitude scores, with a correlation coefficient of 0.715 and a statistical significance of $P<0.001$. (Table 5)

Discussion

To our knowledge, this study was the initial one to examine the understanding and opinions of slaughterhouse employees in Sana'a and Dhamar cities, Yemen.

CCHF human infections primarily arise from tick bites or the act of crushing infected ticks or direct contact with blood or tissues of viremic hosts, as well as with bare hands. Individuals falling into the high-risk category within endemic regions comprise those who engage in occupational interactions with livestock and other animals, such as farmers, livestock owners, abattoir workers, and veterinarians. Given the increased likelihood of tick exposure among this particular population, the dissemination of knowledge pertaining to CCHF, methods of tick bite prevention, and disease prevention itself assumes paramount importance.²¹

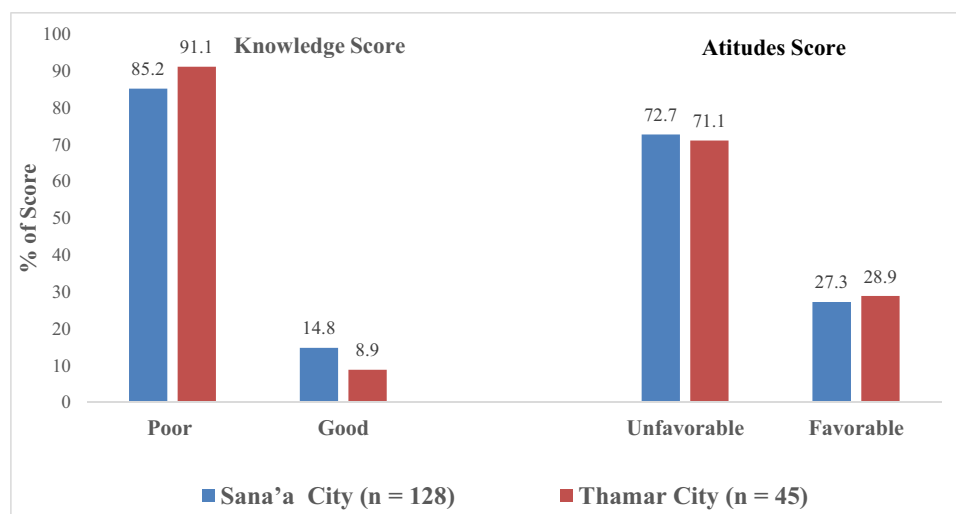


Figure 1 Knowledge and Attitudes scores of participants towards CCHF in Sana'a and Dhamar Cities.

Table 4 Association of Knowledge Score of the Participants with Socio-Demographic Variables

| Item | Knowledge | | | | P value |
|-----------------------|----------------|------|---------------|------|---------|
| | Poor (n = 150) | | Good (n = 23) | | |
| | No. | % | No. | % | |
| Age | | | | | |
| 18–29 | 78 | 45.1 | 16 | 9.2 | 0.905 |
| 30–40 | 40 | 23.1 | 4 | 2.4 | |
| 41–50 | 32 | 18.5 | 3 | 1.7 | |
| Sex | | | | | |
| Male | 131 | 75.7 | 15 | 8.7 | 0.035 |
| Female | 19 | 6.4 | 8 | 4.6 | |
| Marital Status | | | | | |
| Married | 36 | 20.8 | 6 | 3.5 | 0.855 |
| Single | 99 | 57.2 | 17 | 9.8 | |
| Widow/widower | 15 | 8.7 | 0 | 0 | |
| Education | | | | | |
| Literate | 102 | 59 | 5 | 2.9 | 0.039 |
| Illiterate | 48 | 27.7 | 18 | 10.4 | |
| Occupation | | | | | |
| Butchers | 124 | 71.7 | 12 | 6.9 | 0.001 |
| Shepherds | 26 | 15 | 11 | 6.4 | |

Notes: Significant p value < 0.05.

Table 5 Association of Knowledge and Attitude Scores of Participants Towards CCHF (n = 173)

| | Knowledge | | | | P value |
|--------------------|----------------|------|---------------|------|---------|
| | Poor (n = 150) | | Good (n = 23) | | |
| | No. | % | No. | % | |
| Attitude | | | | | |
| Unfavorable (poor) | 120 | 81.7 | 5 | 21.1 | <0.001 |
| Favorable (Good) | 30 | 18.3 | 18 | 78.9 | |
| r (p) | 0.715 (<0.001) | | | | |

Notes: Significant p value < 0.05.

The majority of participants in our study, specifically 87.3%, demonstrated a lack of knowledge regarding CCHF, with 86.1% reporting no exposure to information about CCHF through radio or television. A research conducted by Arikani et al discovered that 54.3% of participants possessed knowledge about CCHF, with 75.2% of them obtaining this information from radio or television sources.²² Consequently, it can be inferred that television and radio broadcasts play a crucial role in disseminating information about CCHF to the general public. Radios serve as an effective means for disseminating information pertaining to diseases within communities. This claim is further supported by the findings of Nyakarahuka et al,²³ who observed that a significant number of study participants acquired knowledge about RVF through radio broadcasts following the outbreak in Kabale district in 2016. The media is widely recognized as the primary conduit for public understanding and awareness of infectious diseases such as CCHF.^{24,25}

Approximately 93.1% of the participants involved in this particular investigation were not knowledgeable regarding the causative agent. The study conducted by Tabatabaei et al revealed that 71% of the respondents were unaware that

Fever of CCHF is induced by a viral pathogen.²⁶ Additionally, other study determined that a third of the respondents were uninformed about the causative agent.²⁷

A research conducted by Gungormus et al discovered that 61.3% of their participants were capable of discerning ticks, while 45.8% were able to recognize tick wounds, and 56.1% acknowledged that not all tick bites result in illness.²⁸ Another investigation disclosed that 59.7% of respondents held the belief that all types of ticks have the potential to cause disease.²² In our examination, 31.2% of participants reported personally encountering tick bites or having a family member who had been bitten. An investigation observed that 18.4% of individuals in their study reported being bitten by ticks or having a relative who had been bitten, whereas the other examination reported a slightly lower percentage of 17.4%.^{22,28}

From the data collected in our study, we discovered that 5.8% of respondents believed that CCHF is a fatal disease. Hatipoglu et al found that the mortality rate due to CCHF was 5.4%, while Ertugrul et al reported a death rate of 5.5%.^{29,30} Other investigations conducted by Arikan et al²² and Gungormus et al²⁸ found that 19.5% and 77.8% of respondents, respectively, believed that CCHF is a severe disease. The majority of the participants, as indicated by the study of Ayebare et al, held the perception that CCHF is a disease that is likely to result in fatality.³¹

It has been well-documented that the transmission of CCHF from one human to another is indeed possible, and this phenomenon has been observed in outbreaks that have taken place within healthcare settings.³² Arikan et al and Gungormus et al^{22,28} have both conducted studies which have revealed that 63.3% and 33.1% of the respondents, respectively, hold the belief that CCHF can indeed be transmitted from human to human. Additionally, in our own study, it was found that 30.3% of the participants stated that CCHF can be transmitted from animals to humans, in comparison to the 22% who believed in the transmission from human to human and the 25.4% who believed in the transmission from animals to humans. While it is widely known that CCHFv is primarily transmitted through tick bites, it is important to note that humans may also contract the infection through direct contact with the blood or tissues of infected humans or livestock.^{33,34} Therefore, individuals who work in the agricultural or butchering industry are at a significantly higher risk of contracting CCHFv infection.³⁵

In our investigation, it was found that the symptoms of CCHF were fever, fatigue, myalgia, headache, low appetite, and various others, with respective frequencies of 35.3%, 34.7%, 29.5%, 30.6%, and 26%. Yilmaz et al²⁷ conducted a study where they observed that fatigue, fever, and headache were prevalent in CCHF patients, with frequencies of 92.3%, 89.4%, and 68.1% respectively. Another study by Ozkurt et al³⁶ revealed that uneasiness, muscle pain, and fatigue were evident in 100% of CCHF cases, while headache, and fever were reported in 76.6% and 75% of cases respectively. A recent study found that 71% of participants knew the common symptoms of CCHF are sudden fever, headache, and myalgias.³⁷

In our study, we found that the participants experienced symptoms of CCHF within different time frames after being bitten by a tick, with frequencies of 19.1%, 8.1%, and 13.3% within 1–3 days, at least 9 days, and longer than 1 month respectively. Yilmaz et al reported that 50% of participants experienced symptoms of CCHF within 1–3 days and at least 9 days after being bitten by a tick, respectively.²⁷ A recent report by Habibzadeh et al discovered that 70% of patients mentioned having been bitten by ticks within the past three days, but 30% of patients did not disclose any tick bites, despite being aware of the presence of ticks and having come into contact with them. The manner in which they came into contact with the ticks involved either removing them from the animal's body or crushing them in various ways. The symptoms appeared suddenly in 60% of patients, and the incubation period for these patients ranged from one to two days.³⁸

The participants of this study indicated the demographic at risk for tick bites; 41% were farmers and shepherds, 39.9% were individuals who visit rural areas, and an additional 32.1% reported being healthcare workers. However, 30.6% of the participants stated that all groups are susceptible to tick bites. Flick and Whitehouse³⁹ and Vorou et al⁴⁰ have documented that individual with occupational exposure to livestock and wild animals, such as farmers, shepherds, and veterinarians, are at a higher risk. Another study conducted by Gungormus Z et al²⁸ revealed that 43.3% of individuals engaged in stock breeding and 37.9% of those involved in farming are at an elevated risk for tick bites.

In the research conducted by Karakeçili et al, it was found that 77.2% of the patients were involved in farming or animal husbandry, and there was a high rate of direct contact with ticks without gloves (52.9%).⁴¹ Tick bites and working with animals are widely recognized as risk factors for CCHF. These risk factors were observed in the majority of CCHF cases in Turkey.⁴²

The results of this study regarding the preventative measures against tick bites indicate that a significant percentage of participants, approximately 34.1%, 30.6%, 28.9%, 25.4%, and 20.8%, expressed the importance of wearing clothing that covers the entire body, reducing exposed areas of the body, refraining from direct contact with ticks using bare hands, wearing gloves, and utilizing insecticides, respectively. Moreover, 32.9% of participants emphasized the need for immediate medical attention, and it was also recommended that the bite area be cleansed with soapy water and alcohol or cologne after tick removal. Additionally, 28.3% of participants pointed out the necessity of removing ticks using tweezers or forceps, while 25.4% emphasized that ticks should not be killed by squeezing or crushing.

In a study conducted by Gungormus et al, it was determined that 45% of individuals acknowledged the efficacy of donning full-body attire, while 15.3% recognized the importance of thoroughly inspecting the body. Additionally, 11.3% of participants acknowledged the significance of avoiding direct contact with ticks using bare hands. Furthermore, a substantial majority of 92.1% affirmed the necessity of seeking immediate medical attention in the event of a tick bite. In contrast, 18% of individuals believed it imperative to remove the tick using tweezers or forceps, and 39.5% stated the importance of cleansing the tick bite site with soapy water, alcohol, or cologne after removing the tick.²⁸ Another study revealed that 58.9% of respondents considered the removal of ticks with tweezers as essential. Similarly, Sumer A. found that 81.5% of ticks were extracted by healthcare professionals in health centers.⁴³ In the same study by Arikan et al, 94.3% of participants emphasized the urgency of seeking medical attention promptly following a tick bite.²² Another investigation reported that 47.7%, 31.4%, 7.1%, 20.1%, and 96.7% of respondents acknowledged the importance of wearing clothes that cover the entire body, reducing exposed skin, refraining from touching ticks with bare hands, wearing gloves, and promptly seeking healthcare, respectively.²⁷

Removing ticks promptly within the first 24 hours is of paramount importance in order to mitigate the potentiality of acquiring CCHF. It is advised to seize the ticks using plastic tweezers, ensuring utmost proximity to their mouthparts, whilst refraining from exerting pressure on their body.^{44,45} Employing tweezers instead of bare hands is widely advocated as the most frequently recommended technique for tick removal.⁴⁴ Individuals who are disinclined or unable to remove ticks autonomously should promptly seek medical assistance at a healthcare facility. Subsequent to the extraction of the tick, the skin ought to be thoroughly cleansed utilizing either soapy water or an antiseptic solution.⁴⁶

In our study about the treatment and vaccination for CCHF, more than 80% of the participants either believed that there was a treatment and vaccination available or expressed uncertainty on the matter. A recent study showed that 70.5% believe that CCHF can be completely cured, and 58.9% believed that there is a vaccine available for CCHF.³⁷ However, ribavirin is only used in severe cases and there is currently no effective antiviral therapy for CCHFV. Treatment mainly consists of providing support. Two vaccines have been developed, but they are not currently recommended for public use.⁴⁷

Knowledge about a disease is considered the initial milestone towards any health education initiative that is being implemented. Being aware of the causes and sources of transmission of a disease increases the likelihood of people understanding the spread of communicable diseases and the preventive measures to slow down transmission. In the current study, it was found that overall, 86.7% (n = 150) of the participants had poor knowledge about CCHF, while 13.3% (n = 23) had good knowledge.

Recently, two studies found that a majority of respondents have poor knowledge about CCHF 58.9% and 79.8%.^{31,37} Another study discovered that healthcare workers in Baluchistan also lack knowledge about CCHF.⁴⁸

The participants in the present study had a poor attitude 72.3% (n=125) towards CCHF, which may lead to undervaluing the issue. Another study concluded by Abdollahi Shahvali et al, that stockbreeders also had an unsuitable attitude towards CCHF and needed training to improve their attitude and prevent CCHF.⁴⁹

Poor knowledge and attitudes towards the disease may be due to low levels of education among majority of the participants, especially Butchers. Education and occupation have been found to be associated with knowledge about CCHF, as reported by Yilmaz et al.²⁷ Individuals with higher levels of education tend to have a better attitude towards CCHF, as they are more likely to study and increase awareness about livestock diseases. This leads to familiarity with protective measures for disease prevention and knowledge that many diseases can be prevented by following guidelines. Therefore, education can influence the attitude of individuals towards CCHF. Similar findings were also reported by Arikan et al, who concluded that a higher level of education leads to a better attitude towards preventive behaviors regarding CCHF.²²

Conclusion

The findings showed that slaughterhouse workers in Yemen have low knowledge and attitudes regarding CCHF. CCHF is a highly transmissible illness necessitates a comprehensive strategy to prevent its spread in Yemen. Due to inadequate infrastructure, limited educational resources, and constrained availability of healthcare and livestock services, preventive measures remain scarce. It is imperative for Yemen's health, agriculture, and media sectors to collaborate with international entities in establishing and executing a strategic framework aimed at enhancing awareness and prevention of CCHF.

Data Sharing Statement

The datasets utilized and scrutinized in this study can be accessed from the corresponding author upon reasonable request.

Ethics Approval

This research received approval from the Research Ethics Committee at the Faculty of Medicine and Health Sciences, Sana'a University, Yemen, adhering to the principles outlined in the Helsinki Declaration. All participants provided written informed consent.

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Author Contributions

All authors made a significant contribution to the work reported, whether that is in the conception, study design, execution, acquisition of data, analysis and interpretation, or in all these areas; took part in drafting, revising or critically reviewing the article; gave final approval of the version to be published; have agreed on the journal to which the article has been submitted; and agree to be accountable for all aspects of the work.

Disclosure

The authors report no conflicts of interest in this work.

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