

Original article

Knowledge, attitude, and practice of butchers regarding Crimean-Congo hemorrhagic fever in an endemic area of Iran

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Abstract

Background: Crimean-Congo hemorrhagic fever (CCHF) is an important zoonotic disease, particularly in endemic countries, with considerable public health implications. Previous studies in Iran suggest that CCHF poses a substantial health risk to slaughterhouse workers and butchers.

Objective: To investigate the knowledge, attitude, and practice of butchers regarding CCHF at their place of work in an endemic area in Southeastern Iran.

Methods: Data collection was performed using a convenience sampling method. The study included 60 eligible butchers from Zarand City. Data were collected using a questionnaire, and statistical analysis was performed using SPSS version 22.

Results: The average scores of the participants' knowledge, attitude, and practice were 2.6 ± 1.5 , 25.4 ± 3.2 , and 21.8 ± 4.1 , respectively, indicating most butchers had good knowledge of and a positive attitude toward and practice regarding CCHF safety measures. There was no significant difference between the participants' knowledge, attitude, and practice in relation to the studied variables. However, Pearson correlations revealed significant positive correlations between knowledge and attitude ($r = 0.345$), between knowledge and practice ($r = 0.295$), and between practice and attitude ($r = 0.361$) with regard to CCHF disease.

Conclusion: The current study results can help prevent occupational health risks related to work-acquired CCHF among butchers. We recommend that more comprehensive studies be conducted to evaluate other occupations that are at high risk of acquiring CCHF in Iran.

Keywords: Attitude practice, butcher, Crimean-Congo hemorrhagic fever, Iran, knowledge.

Crimean-Congo hemorrhagic fever (CCHF) is a zoonotic disease⁽¹⁾ and a reemerging viral hemorrhagic fever disease in Asia, Africa, Eastern Europe, Spain, and France.^(2,3) CCHF is considered an occupational disease, which spreads among high-risk groups such as butchers, slaughterhouse workers, farmers, veterinarians, and healthcare workers.^(2,4) Butchers and slaughterhouse workers face increased risks of contracting zoonotic diseases, including CCHF,

brucellosis, Q fever, tularemia, anthrax, toxoplasmosis, leptospirosis, and melioidosis, because of their frequent contact with infected animal tissues.^(5,6)

CCHF virus (CCHFV) is primarily transmitted via tick bites or through direct contact with the blood and tissues of infected animals, especially during slaughtering, veterinary procedures, or hospital settings.^(2,7,8) Previous studies have suggested that the distribution and transmission of CCHF are influenced by environmental and socioeconomic factors.⁽⁷⁾ Among the socioeconomic factors, the butcher occupation stands out because of their frequent handling of potentially infected livestock tissues.⁽²⁾ Moreover, slaughterhouse workers' risk of contracting zoonotic diseases varies according to their knowledge, attitudes, use of personal protective equipment, and

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the facility type (industrial vs. conventional).^(5, 6) Pathogens can spread in two ways in the workplace, either directly through worker infections or indirectly, where the worker acts as a vector for community transmission.⁽⁹⁾ Given the potential for community outbreaks, increasing butchers' awareness about CCHF is essential for implementing effective preventive measures.⁽²⁾

CCHF has been reported in approximately 50 countries worldwide⁽¹⁰⁾, particularly in Africa, the Middle East, Asia, and Southeastern Europe.^(11, 12) The prevalence thereof has steadily increased in endemic regions, such as Pakistan, India, China, Iran, Kazakhstan, Egypt, Iraq, the UAE, Saudi Arabia, and Turkey.⁽¹⁾ Iran, as a CCHF endemic region, has experienced outbreaks over the past 15 years^(13, 14), with recent studies documenting its prevalence in 29 provinces.^(15, 16) The seroprevalence among occupational groups in Iran ranges from 0.75% to 16.5%⁽⁵⁾, with rates reported in Khuzestan (7.0%)⁽⁵⁾, Sistan and Baluchestan (16.5%)⁽¹⁷⁾, Isfahan (5.0%)⁽¹⁸⁾, Yasuj (7.4%)⁽¹⁹⁾, and Khorasan (14.8%)⁽²⁰⁾

The Kerman province, which is located in southern Iran, has climate conditions that are conducive to CCHFV spread^(21, 22) and is an endemic region for such diseases.⁽²³⁾ Moreover, its proximity to other CCHF-endemic countries, such as Afghanistan and Pakistan, heightens the risk of disease introduction via infected livestock and tick vectors.^(1, 24, 25) Furthermore, Kerman's role as a livestock import gateway further enhances the likelihood of

transmission throughout Iran. To address these risks, stringent measures, such as quarantining livestock, inspecting for ticks at borders, and entomological surveillance, are crucial for early outbreak detection. Proper handling of potentially infected livestock and improving safety measures in high-risk occupations, such as butchers and slaughterhouse workers, are critical preventive strategies.

Assessing the knowledge, attitude, and practice (KAP) of butchers regarding CCHF is pivotal for the development of targeted education and prevention programs. While previous research has explored CCHF awareness in cities such as Kerman and Rafsanjan, other areas, including Zarand, remain underexplored. Zarand is a high-risk region for CCHF, thus emphasizing the need for heightened awareness among butchers who may handle high-risk tissues. This study aimed to evaluate and improve KAP among Zarand's butchers, thereby filling a crucial knowledge gap. To the best of our knowledge, this is the first study that investigates KAP toward CCHF in Zarand.

Materials and methods

Study area

This study was performed in Zarand City, located in the northern region of the Kerman province in Southeastern Iran (30° 48' 46" N, 56° 33' 50" E). The city has a population of approximately 54,745 people, distributed across 12,992 households (**Figure 1**).



Figure 1. Location of the study areas in Zarand city, Southeast of Iran. (Images provided through Google Earth Professional (<https://www.google.com/earth/versions/#download-pro>)).

Sample and sampling technique

This descriptive cross-sectional study evaluated the KAP of butchers regarding CCHF at their workplaces in Zarand City from January to March 2022. Data collection was performed using a convenience sampling method. Participants in this study included a total of 60 butchers from Zarand City and included all available individuals in this occupational group. Informed consent to participate in the KAP survey was obtained, and the questionnaire was completed. A single interviewer conducted the survey, interacting directly with the participants and arranging face-to-face interviews to ensure consistency in data collection. The butcher's responses were recorded in real time by the interviewer.

Data collection

Data were collected using a questionnaire that was originally developed by Gorouhi MA, *et al.*⁽²⁾ The questionnaire consisted of four sections, namely demographic information about the participants, five questions assessing their knowledge, six questions evaluating their attitudes, and six questions examining their practices. The validity of the questionnaire was confirmed by a panel of experts, and its reliability was established through a preliminary study, which achieved a Cronbach's alpha coefficient of 0.85.

Ethical considerations

This study was reviewed and approved by the Ethics Committee of Kerman University of Medical Sciences (IR.KMU.REC.1401.171). Written informed consent was obtained from each participating butcher prior to inclusion in the study. The findings were shared with the Zarand City Health Center and the Department of Vector Biology and Control at Kerman University of Medical Sciences.

Statistical analysis

Data analysis was conducted using SPSS software version 22. Descriptive statistics were used, including the mean, standard deviation (SD), charts, and frequency distribution tables. Furthermore, appropriate inferential statistical tests, such as the independent *t*-test, one-way analysis of variance (ANOVA), Pearson correlation test, and simple linear regression, were applied. A *P*-value <0.05 was considered statistically significant. Results were reported as the mean \pm SD. Graphs were generated using GraphPad Prism software version 8.4.3.

Results

Sociodemographic characteristics

A total of 60 butchers participated in this study, all of whom were male. The largest age group (38.3%) was between 36 and 45 years old. The results revealed that 83.3% of participants were married, and the majority had either primary- or diploma-level education, with only 3.3% who had a university degree. Most butchers reported having 11–20 years of work experience. The mean knowledge, attitudes, and practices scores (min–max) of the participants were 2.6 ± 1.5 (0–4), 25.4 ± 3.2 (15–30), and 21.8 ± 4.1 (4–21), respectively. One-way ANOVA revealed no significant differences in the KAP scores (Table 1).

Respondents' knowledge toward CCHF

In this study, participants were asked five questions (A–E) to evaluate their knowledge of CCHF. The majority (76.7%) reported general awareness of the disease. Furthermore, 73.3% demonstrated basic knowledge of its route of transmission, and 71.7% were familiar with its primary symptoms.

A significant proportion of participants (93.3%) were aware of preventive measures against CCHF. However, 63.3% lacked knowledge about the specific symptoms of CCHF in livestock, compared with the 36.7% who were familiar with them (Table 2).

To identify the primary source of participants' information about CCHF, a specific question was included in the study. The majority of the respondents indicated that the veterinary organization was their primary source of information about CCHF. The distribution of the participants' sources of knowledge is presented in Figure 2.

Respondents' attitude toward CCHF

In this study, six questions (A–F) were developed to evaluate the participants' attitudes toward CCHF. The findings revealed that 45.0% of butchers were strongly opposed to consuming meat immediately after slaughtering livestock, whereas 1.7% expressed no opinion on the matter.

A majority (61.7%) of respondents believed that butchers should receive training on preventive measures for CCHF before starting work. Furthermore, regarding the cleaning of contaminated clothing, 60.0% of participants agreed that it was essential, whereas 3.3% disagreed.

Table 1. The mean score of knowledge, attitude, and practice in terms of butchers' demographic variables (n = 60).

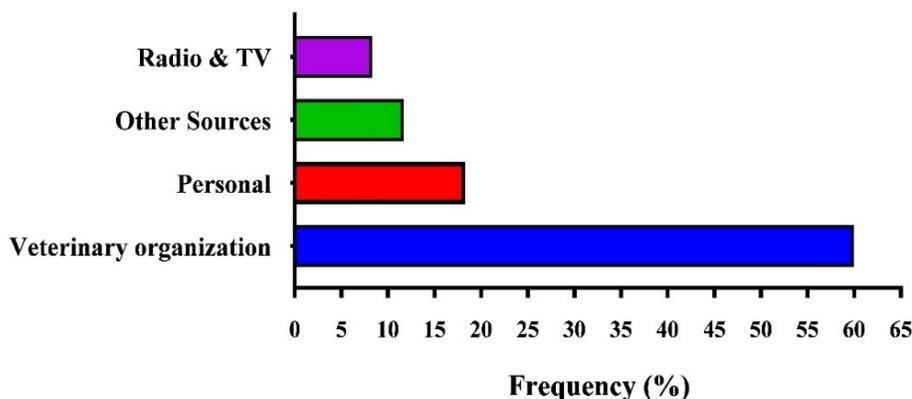
Variables	Categories	n (%)	Knowledge Mean ± SD	Attitude Mean ± SD	Practice Mean ± SD
Education	Illiterate	2 (3.3)	2.0 ± 2.8	23.5 ± 3.5	17.5 ± 3.5
	Primary	14 (23.3)	2.7 ± 1.7	21.7 ± 3.1	15.8 ± 3.7
	Diploma	23 (38.3)	2.7 ± 1.2	20.7 ± 3.3	16.6 ± 2.0
	University	19 (31.7)	2.0 ± 1.4	17.5 ± 0.7	16.5 ± 0.7
P-value	-	-	0.698	0.485	0.144
Effect size (95%CI)			0.11 (0.00, 0.25)	0.08 (0.00, 0.21)	0.02 (0.00, 0.09)
Age (years)	<25	2 (3.3)	2.1 ± 1.1	24.0 ± 8.5	13.5 ± 3.5
	25–35	26 (43.3)	2.3 ± 1.6	20.7 ± 3.2	16.1 ± 2.5
	36–45	26 (43.3)	2.8 ± 1.3	20.8 ± 3.5	17.1 ± 2.0
	>45	2 (3.3)	2.5 ± 1.5	21.2 ± 3.2	15.5 ± 3.7
P-value	-	-	0.093	0.180	0.740
Effect size (95%CI)			0.02 (0.00, 0.10)	0.04 (0.00, 0.14)	0.09 (0.00, 0.22)
Marital status	Single	5 (8.3)	3.4 ± 0.5	22.2 ± 5.5	16.6 ± 1.8
	Married	50 (83.3)	2.6 ± 1.5	21.2 ± 3.0	16.4 ± 2.9
	Others	1 (1.7)	2.0	20.0	15.0
P-value	-	-	0.093	0.752	0.875
Effect size (95%CI)			0.08 (0.00, 0.22)	0.01 (0.00, 0.08)	0.01 (0.00, 0.05)
Work experience (years)	1–10	11 (18.3)	2.9 ± 1.5	20.5 ± 4.2	15.4 ± 1.9
	11–20	26 (43.3)	2.5 ± 1.5	21.3 ± 2.5	15.8 ± 3.7
	>20	19 (31.7)	2.5 ± 1.6	21.1 ± 3.2	16.5 ± 0.7
P-value	-	-	0.698	0.789	0.086
Effect size(95%CI)			0.01 (0.00, 0.09)	0.01 (0.00, 0.07)	0.08 (0.00, 0.23)

* Significant at $P < 0.05$. CI, confidence interval; SD, standard deviation.

Table 2. The number and percentage of participants' knowledge about the CCHF disease (n = 60).

Questions	Categories	N	(%)
Do you know CCHF?	No	14	23.3
	Yes	46	76.7
Do you know transmission about of CCHF?	No	10	16.7
	Yes	44	73.3
Do you know symptoms of CCHF in human	No	10	16.7
	Yes	43	71.7
Do you know preventive measure for CCHF?	No	4	6.7
	Yes	56	93.3
Do you know the symptoms of CCHF in livestock?	No	38	63.3
	Yes	22	36.7

CCHF, Crimean-Congo hemorrhagic fever.

**Figure 2.** The source of knowledge (%) about CCHF disease among butchers (n = 60). CCHF, Crimean-Congo hemorrhagic fever.

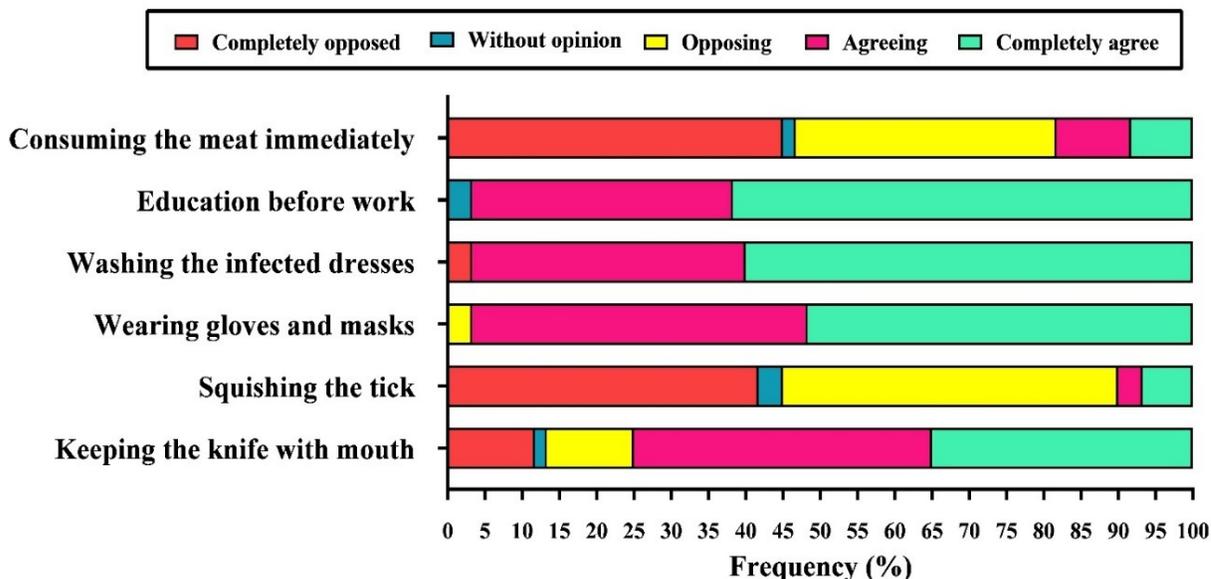


Figure 3. The frequency (%) of participants' attitude toward CCHF disease. CCHF, Crimean-Congo hemorrhagic fever.

When asked about the use of masks and gloves during slaughtering, 45.0% agreed and 51.7% strongly agreed that these protective measures should be practiced. In contrast, 45.0% and 41.7% were opposed and strongly opposed, respectively, to the practice of crushing ticks. However, concerning the habit of keeping a knife in the mouth while slaughtering, 40.0% agreed and 35.0% strongly agreed that this practice was acceptable. The detailed distribution of the participants' attitudes toward CCHF is presented in **Figure 3**.

Respondents' practices regarding CCHF

Participants' practices with regard to CCHF were assessed through six questions (A–F). The percentages reflecting the respondents' practices are presented in **Table 3**. In addition, a heat map illustrating the participants' attitudes toward CCHF in the study population (n = 60) is provided in **Figure 4**.

Pearson correlation among KAP

Pearson correlation analysis revealed significant positive correlations between knowledge and attitude ($r = 0.345$), knowledge and practice ($r = 0.295$), and practice and attitude ($r = 0.361$) with respect to CCHF disease.

Effect of knowledge and attitude scores on practice

As shown in **Table 4**, simple linear regression analysis indicated a positive effect of knowledge on the participants' practices. However, attitude did not have a significant effect on their practices.

Discussion

CCHF is a notable public health concern in Iran.⁽²⁶⁾ In endemic regions, butchers who handle potentially infected livestock play a crucial role in adhering to safe work practices.⁽²⁾ To address this, a cross-sectional, questionnaire-based study was performed among 60 butchers in Zarand City, located in Kerman province. This province reports a high annual prevalence of human CCHF in Iran.⁽¹⁶⁾ The responses from the butchers provided valuable insights into their KAP regarding CCHF in Zarand City (**Figure 5**).

Several studies have investigated the KAP of butchers regarding CCHF in various countries, including Pakistan, Uganda, Georgia, Libya, and Iran. However, further research is required to examine the association between butchers' workplace awareness and their attitudes toward CCHF. Furthermore, previous studies regarding KAP of CCHF have been conducted in several Iranian provinces, such as Kerman,⁽²⁾ Khuzestan⁽²⁷⁾, and Ilam⁽²⁸⁾, all of which are endemic areas. Our study found that 76.7% of participants had a good level of knowledge about CCHF. This result aligns with the findings of Gorouhi MA, *et al.*, who reported that >70.0% of butchers in Kerman were knowledgeable about CCHF.⁽²⁾ In contrast, Shahvali EA, *et al.* identified that farmers and slaughterhouse workers in Shoushtar had an inadequate understanding thereof.⁽²⁷⁾ Similarly, a study in Ilam revealed that only 14.8% of participants had comprehensive knowledge about CCHF⁽²⁸⁾, which indicates a much lower level of understanding compared to our findings in Zarand City.

Table 3. The percentage of participants' practice about the CCHF disease (n = 60).

Questions	Categories	(%)
A. Do you use appropriate long clothes that cover the whole body when slaughtering animals?	Never	1.7
	Sometimes	51.7
	Always	43.3
B. Do you use a mask when slaughtering animals?	Never	11.7
	Sometimes	43.3
	Always	43.0
C. Do you use special glasses when slaughtering animals?	Never	31.7
	Sometimes	41.7
	Always	25.0
D. Do you use boots when slaughtering animals?	Never	5.0
	Sometimes	28.3
	Always	66.7
E. Do you use gloves when slaughtering animals?	Never	18.3
	Sometimes	43.3
	Always	33.3
F. Do you hold your knife in your mouth while you kill?	Never	85.0
	Sometimes	8.3
	Always	3.3

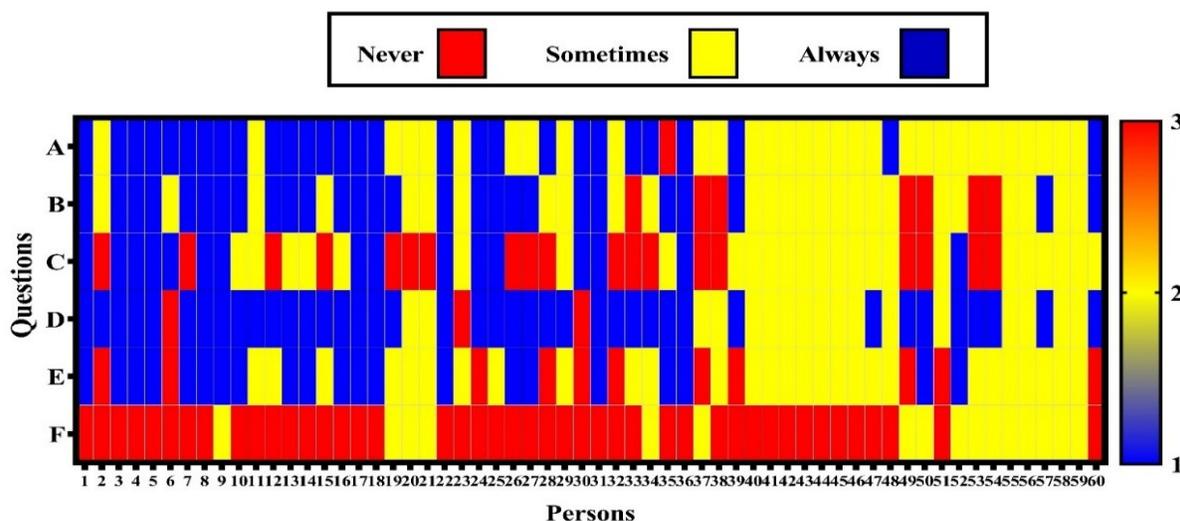


Figure 4. Heat map showing practice of participants about CCHF disease in the study population-based number (n = 60). CCHF, Crimean-Congo hemorrhagic fever.

Khaleeq TA, *et al.* reported that in Rawalpindi, Pakistan, only 9.3% of butchers had comprehensive knowledge about CCHF^(4,29), which is in stark contrast to our finding of 76.7% knowledgeable butchers. Similarly, other studies from Pakistan have highlighted low knowledge levels among shepherds.⁽³⁰⁾ While emergency healthcare professionals demonstrated a better understanding⁽³¹⁾, the general public's knowledge remains limited. Jamil H, *et al.* reported that 20.2%, 33.3%, and 48.2% of the general population exhibited good knowledge, attitudes, and practices, respectively, regarding CCHF.⁽³²⁾ Ayebare D, *et al.* found that in Uganda, only 12.8% of livestock

value chain incumbents had adequate knowledge about CCHF⁽³³⁾, further emphasizing the higher level of knowledge observed in our study. In addition, Greiner AL, *et al.* noted that fewer than 30.0% of residents in Georgian villages were aware of the risks associated with CCHF.⁽³⁴⁾

This variability in CCHF knowledge among the different at-risk groups may arise from differences in educational resources and the literacy levels across regions. In addition, the timing of this study, which was performed during the COVID-19 pandemic, may have contributed to heightened awareness among butchers about viral diseases, including CCHF.

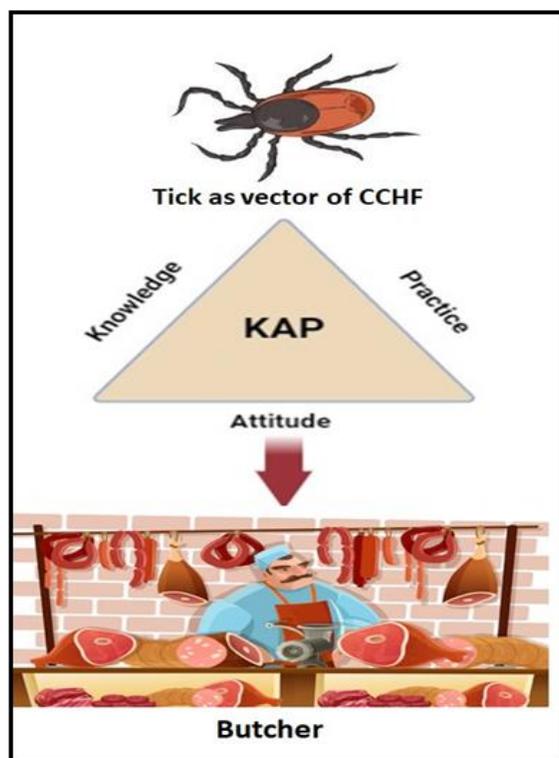


Figure 5. Butchers KAP regarding CCHF in Zarand city, Iran. CCHF, Crimean-Congo hemorrhagic fever; KAP, knowledge, attitude, and practice.

Our findings revealed that most butchers (60.0%) obtained their information about CCHF from veterinary organizations. This likely reflects the active role of the veterinary organization in Zarand City, which conducts educational sessions on CCHF for local butchers. Similar findings were reported in a study conducted in Kerman.⁽²⁾ However, research from Rawalpindi, Pakistan, indicated that butchers primarily obtained their CCHF information from television.⁽⁴⁾ Furthermore, earlier studies in Iran⁽²⁸⁾ identified television as the predominant source of information, thus highlighting differences in how educational messages are disseminated across regions. Our study found a positive correlation between the butchers' knowledge of CCHF and their attitudes and practices regarding its prevention, which is consistent with findings from a previous study performed in Iran. The strong knowledge observed among the butchers in our study can be largely attributed to their participation in educational classes about CCHF.⁽²⁾ Furthermore, our findings highlighted that work experience significantly influences KAP, thereby aligning with similar previously reported observations.⁽²⁾

One of the limitations in this study was the small sample size. The sample size was limited to the total number of butchers in Zarand City, which may affect the generalizability of the findings to other populations or regions. Therefore, it is suggested that in future

studies, slaughterhouse employees should be included to increase the sample size. In addition, all of the participants were male because, in Iran, women are generally not employed as butchers due to cultural reasons.

Conclusion

Most butchers in Zarand City demonstrated comprehensive knowledge, positive attitudes, and effective practices with regard to CCHF. The significant positive correlation between the butchers' knowledge and their attitudes and practices emphasizes the value of information provided by veterinary organizations. This highlights the importance of continuing collaboration with these organizations to sustain and enhance butchers' awareness via ongoing training workshops. This study may serve as a foundation for further research on workplace hazards, including infectious diseases. Further investigations are required to explore the factors that influence butchers' practices in the workplace. In addition, it is recommended that future studies be extended to include other high-risk groups for CCHF in Iran to broaden the understanding and improve preventive measures.

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Conflict of interest

Each of the author has completed and ICMJE disclosure form. The authors declare that they do not have any potential or actual relationship, activity, or conflict of interest related to the content of this article.

Data sharing statement

Data generated or analyzed for the present report are included in this published article. Further details are available from the corresponding author on reasonable request after the deidentification of the patient whose data are included in the report.

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