Predictors of Observance of Preventive Behaviors Toward Crimean-Congo Hemorrhagic Fever by Butchers in Qom City in Central Iran

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Abstract

Background: Crimean-Congo hemorrhagic fever (CCHF) is a viral zoonosis. Ranchers, butchers, and slaughterhouse workers run the risk of contracting the disease more than others.

Objectives: This study was aimed at the evaluation of occupational behaviors and practices of butchers and meat industry workers regarding CCHF based on the health belief model (HBM).

Methods: The present descriptive-analytical study was carried out among 207 local butchers working in slaughterhouses who were selected by cluster sampling in Qom City in the first six months of 2019. To collect data, a researcher-made questionnaire based on the HBM constructs was used. The validity and reliability of the questionnaire have been verified. The data were analyzed by SPSS version 21 using regression analysis and Pearson correlation coefficient.

Results: A total of 141 (68.12%) of the participants used personal protective equipment, including appropriate workwear, gloves, mask, goggles, and boots when they had direct contact with raw meat products. There were significant positive relationships between CCHF preventive behaviors and perceived barrier structures (P = 0.003), perceived benefits (P = 0.004), perceived severity (P = 0.002), perceived susceptibility (P = 0.001), and cues to action (P = 0.001). Based on linear regression analysis, perceived susceptibility was able to predict 96% of the variance of CCHF preventive behaviors in Qom's butchers.

Conclusions: Perceived susceptibility is a predictor of CCHF preventive behaviors; thus, future plans and programs are suggested to be based on the HBM and emphasize increasing perceived susceptibility and other constructs of this model to improve the disease-preventing behaviors of butchers.

Keywords: Crimean-Congo Hemorrhagic Fever, Health Belief Model, Preventive Behaviors

1. Background

Crimean-Congo hemorrhagic fever (CCHF) is a zoonotic disease transmissible from animals to humans. The disease is usually transmitted to humans by tick bites, direct contact with the blood, meat, and tissue of newly slaughtered animals, or hospital contacts with a person already infected with CCHF (1). Crimean-Congo hemorrhagic fever is also regarded as an occupational disease that threatens ranchers, butchers, meat industry workers, veterinarians, nurses, doctors, and laboratory personnel more than any other occupation. The CCHF virus is incapable of causing disease in warm-blooded mammals such as cows, sheep, and goats, but it can spread in their bodies. Thus, their role as an intermediate host or reservoir of the disease is of crucial prominence (2). In terms of the geographical distribution of the disease, CCHF is prevalent in several regions of Africa, eastern and southern Europe, the Middle East, central Asia, and India. It is prevalent as an epidemic disease, and its mortality rate spans from 10% to 40% (3, 4). The disease is endemic in over 30 countries around the world, including Iran, and currently, there have been reports of virus detection of the disease or the presence of its antibody in several neighboring countries, including Iraq, Saudi Arabia, the United Arab Emirates, Pakistan, and Turkey (5). According to the geographical distribution of CCHF in 2015, Iran is

located in the regional belt of this disease with a high incidence rate, particularly in eastern provinces such as Sistan and Baluchestan, Fars, and Khorasan (6). As of 1999 to January 2012, 870 confirmed cases of CCHF have been reported, with 126 deaths and a case fatality rate (CFR) of 17.6%. The disease has been recorded in 26 of the country's 31 provinces, with the majority of cases being reported in Sistan and Baluchestan, Isfahan, Fars, Tehran, Khorasan, and Khuzestan provinces (7).

Several suspicious cases of CCHF are annually diagnosed and hospitalized in different regions of Qom Province. Recently, there have been reports of CCHF contraction via tick bites, direct contact with animals' blood while being slaughtered, and eating slaughtered animals' raw liver in Qom City (8). One way to prevent the transmission of viral diseases is the implementation of health education programs for susceptible people in all age groups (9). Health education is a sophisticated process that usually includes several predictive behaviors improving the health status of the community (10). The foremost purpose of such programs in terms of CCHF is to improve the knowledge, attitudes, and performance of people so that they can exhibit more preventive behaviors to prevent CCHF infection. Such preventive behaviors include personal protection against tick bites and avoiding direct contact with the meat, blood, or secretion of a newly slaughtered animal infected with CCHF (11).

Experts adopt several different methods and models to investigate and identify the factors affecting the performance of people exposed to the disease; one of the most effective types of such models is the Health Belief model (HBM), which is widely used for modeling people's health-related behaviors (12). This model comprises the five initial constructs of perceived susceptibility, perceived severity, perceived barriers, perceived benefits, and self-efficiency, and it can help to predict individuals' behaviors regarding the diagnosis, control, and treatment of diseases (13). Based on this model, if people see themselves as susceptible to a situation (perceived susceptibility) and believe that this situation is potentially dangerous for them with negative consequences (perceived severity) and believe that taking some measures can save them from those negative consequences (perceived benefits) despite some costs (perceived barriers), they feel confident and proficient enough (self-efficiency) to implement the necessary measures and prevent diseases (14).

2. Objectives

Therefore, this study aimed at investigating the CCHF preventive behaviors of butchers and meat industry workers in Qom City based on the HBM.

3. Methods

3.1. Data Collection

This was a cross-sectional study conducted among 207 local butchers and meat industry workers working in Qom's slaughterhouses and meat distribution centers during the first six months of 2019.

Sample size was determined based on Krejcie and Morgan's study (15). Since population size was 450 by considering type-one error equal to 0.05 and a 0.95 confidence, information of 207 individuals was obtained (15). In this descriptive-analytical study, the study population included all butcheries, slaughterhouses, and meat distribution centers in Qom City. The multistage cluster sampling method was used to select regions and butcheries in this city. Based on urban region, city was segmented into four regions, due to the socio-cultural homogeneity expectation of each region, they were considered as a stratum. Regarding of the number of butchers in each of them, proportional stratified sampling was performed.

The participants were butchers or meat industry workers working in butcheries and/or slaughterhouses in Qom City; those who were not willing to participate or continue to do so were excluded from the study. After explaining the aims of the study for the participants and acquiring their consent, the questionnaire was distributed among them. This questionnaire consisted of three sections. Section 1 addressed the demographic information of the participants (five questions), section 2 included the constructs of the HBM (four questions for perceived susceptibility, five questions for perceived severity, five questions for perceived benefits, five questions for perceived barriers, four questions for self-efficiency and four questions for cues to action). The questionnaires were completed by educated medical students. In this way, the questionnaire asked the butchers and slaughterhouses the questions, and the answers of the participants were marked in the questionnaire.

3.2. Ethical Considerations

This study was approved by the Ethics Committee of Qom University of Medical Sciences (code: IR.MUQ.REC.1399.022).

3.3. Inclusion and Exclusion Criteria

The butchers and meat industry workers with incomplete questionnaires were excluded from the study. The inclusion criterion for the study was residence in Qom City.

3.4. Statistical Analysis

The answers to this section were based on a 5-point Likert scale (ranging from 'completely agree' to 'completely disagree'), with each question having a score ranging from one to five. Section 3 comprised of occupational behaviors and performance regarding CCHF preventive behaviors (six questions) with answers based on a 3-point Likert scale ('yes', 'no' and 'somehow'). In this section, two scores were assigned to 'yes', one score to 'somehow', and '0' to 'no'. Thus, the highest score in the third section of the questionnaire was 12, and the lowest score was 0.

The face validity of the questionnaire was established in terms of wording clarity, the likelihood the target audience would be able to answer questions, and the layout and style. To determine the content validity of the questionnaire, the quantitative method was utilized, and the ratio of content validity (CVR) to content validity index (CVI) was calculated for the questionnaire items. To obtain the CVR, 12 experts and professors were asked to comment on the items associated with each construct with any of the possible three responses of "essential", "useful but not essential", and "not essential". In this study, based on LAWSHE, the critical value for CVR was considered 0.56 ([16]). After scrutinizing the questionnaire, seven items were excluded because they did not obtain the requisite ratio. To determine the CVI, the experts' ideas were used regarding the three criteria of simplicity, relevance, and clarity. A 4 point Likert scale was used for each criterion. The CVI was determined for each item, and the value of 0.79 was considered as the acceptable criterion for keeping the questionnaire items. To examine the reliability of the questionnaire, the questionnaire was distributed among 20 butchers on a random basis, and after collecting the data, the Cronbach's alpha coefficients were calculated as follows: perceived susceptibility ($\alpha = 0.83$), perceived severity ($\alpha = 0.91$), perceived benefits ($\alpha = 0.91$), perceived barriers ($\alpha = 0.89$), self-efficiency ($\alpha = 0.90$), cues to action ($\alpha = 0.90$), and occupational behavior ($\alpha = 0.92$).

SPSS version 21 was used to assess the internal correlations of the HBM's constructs by the Pearson correlation coefficient. The significance level was set at a P-value of less than 0.05.

4. Results

Overall, 207 butchers and workers working in local butcheries and slaughterhouses in Qom City participated in the study and completed the questionnaire. Regarding the participants' education level, 69 (33.33%) participants had a middle school degree, and 88 (42.51%) samples had a high school diploma or more advanced academic degrees.

Of all the participants, 141 (68.12%) people reported that they used personal protective equipment (i.e., appropriate workwear, gloves, mask, goggles, and boots) while in direct contact with raw meat products, 10 (4.83%) respondents stated that they had experienced eating fresh liver, and 12 (5.8%) participants mentioned that they had experienced direct contact with ticks.

The highest mean of the HBM constructs among the participants belonged to the perceived benefits (16.02 ± 3.04), and the lowest mean belonged to CCHF preventive behaviors (10.77 ± 2.08) (Table 1). The results demonstrated that self-efficiency had a significant correlation with contact time (P = 0.009). Likewise, perceived barriers had a significant correlation with age (P = 0.005), education level (p = 0.003), contact time with raw meat products (P = 0.003), and the use of personal protective equipment (P = 0.05). The results also revealed that the perceived benefits construct had a significant relationship with education level (P = 0.004), and the perceived severity construct had a significant correlation with education level (P = 0.009), contact time (P = 0.05), and the use of personal protective equipment.

The results of Pearson correlation analysis showed that CCHF preventive behaviors had a significant positive correlation with perceived barrier structures (P = 0.003), perceived benefits (P = 0.004), perceived severity (P = 0.002), perceived susceptibility (P = 0.001), and cues to action (P = 0.001).

The results of the relationships between the HBM constructs and preventive behaviors are depicted in Table 2. The results of linear regression analysis showed that perceived susceptibility was able to predict 96% of the variance of CCHF preventive behaviors of butchers in Qom City (Table 3).

5. Discussion

This descriptive-analytical study was conducted among 207 butchers and meat industry workers working in slaughterhouses and butcheries in Qom City to investigate the CCHF preventive behaviors based on the HBM model. To collect the required data, a researcher-made questionnaire was employed according to the HBM constructs. The results of the study demonstrated that perceived susceptibility was the most important predictive factor of CCHF preventive behaviors in butchers. This finding contrasts the findings of Masoudy et al.'s study ([17]), where they observed that perceived self-efficiency was the strongest predictive factor of CCHF preventive behaviors. The reason for such a difference might be that perceived susceptibility is one of the strongest motives in people encouraging and stimulating them to display

Table 1. The Mean and Standard Deviation of the Health Belief Model Constructs Among Butchers in Central Iran

Variables	Score Range	Mean ± SD	Lowest Score	Highest Score
Perceived susceptibility	0 - 16	10.96 ± 2.04	1	16
Perceived severity	0 - 20	12.96 ± 1.57	4	20
Perceived barriers	0 - 20	14.96 ± 2.89	0	20
cues to action	0 - 16	12.94 ± 1.37	4	20
Perceived benefits	0 - 20	16.02 ± 3.04	0	20
Self-efficiency	0 - 16	12.36 ± 2.61	4	20
Occupational behavior	0 - 12	2.08 ± 10.77	0	12

Table 2. The Pearson Correlation Coefficients Between the Health Belief Model Constructs and Crimean-Congo Hemorrhagic Fever Preventive Behaviors in Butchers in Central Iran[a]

HBM Constructs and Preventive Behaviors	Self-efficiency	Perceived Barriers	Perceived Benefits	Perceived Severity	Perceived Susceptibility
Behavior	0.285	0.182**	0.485**	0.135*	0.983**
Perceived susceptibility	0.267**	0.171*	0.490**	0.145*	
Perceived severity	- 0.019	-0.153*	-0.187**		
Perceived benefits	0.198**	0.040			
Cues to action	0.234**	0.141*	0.470**	0.125*	
Perceived barriers	0.573**				

[a] * Significant difference assigned at $P < 0.05$, **significant difference assigned at $P < 0.01$.

Table 3. The Results of Linear Regression Analyses Between the Mean Scores of CCHF Preventive Behaviors and Mean Scores of the HBM Constructs in Butchers in Central Iran

Variable	P	Beta	b	R Square	R
Perceived susceptibility	0.001	0.975	0.992	0.966	0.983

healthier behaviors. In other words, if the probability of perceived danger is higher in a person, the probability of exhibiting protective behaviors also rises (18).

The results of the present study also exhibited that CCHF preventive behaviors had a significant positive relationship with perceived barriers, perceived susceptibility, perceived benefits, perceived severity, and cues to action. The analysis of the acquired data showed a significant positive correlation between perceived severity and preventive behaviors. This means that an increase in perceived severity improved the frequency of preventive behaviors among the participants of the study. Therefore, it can be argued that the perception and understanding of the severity of a disease and its negative consequences (e.g., serious health consequences and death, costs and treatment time) can enhance the chance of exhibiting more preventive behaviors. This finding is in agreement with the results of previous studies focusing on zoonotic diseases (19, 20), though it runs counter to the findings of Masoudy et al.'s study (17) regarding CCHF. Masoudy et al.'s study (17) showed significant positive relationships between CCHF preventive behaviors and perceived benefits, self-efficiency, and cues to

action. In our study, perceived barriers had a significant relationship with age, which was consistent with Kafaee et al.'s findings (21). However, it disagrees with Bastami et al.'s study (22). It seems that age can be effective in adopting health behaviors by influencing the benefits and barriers to behavior (23).

The positive relationships between the perceived benefit construct and CCHF preventive behaviors also demonstrates that the more people are aware of the benefits of healthy and preventive behaviors, the more they display such healthy behaviors (24). The results showed that the majority of the participants were in the 21 - 80 age group, with more than half of them having a high school diploma or lower degrees. This finding is in agreement with the results of Masoudy et al.'s study (17) in the city of Zabol, Shahvali in Shoushtar, and Shahhosseini in Mashhad, and a study in India that all focused on identifying the groups at high risk for CCHF (17, 25, 26). More than half of the participants were married living in urban areas, and the majority of them had a history of contact with the carcass, blood, or fresh meat of newly-slaughtered animals. These findings all agree with the findings of Sharifi-Mood et al.'s

study on the prevalence of CCHF in 1998-2010, where they reported that more than half of patients suffering from CCHF worked in butcheries and slaughterhouses and had direct contact with animals (27). Saghafipour et al. (8) also found similar results showing that about half of the patients contracted CCHF because of direct contact with the carcass, blood, or meat of slaughtered animals in Qom City. In this study, the number of the participants whose education level was beyond high school diploma was higher than the number reported in Masoudy et al.'s study (17) in Sistan and Baluchestan Province yet, the education level of more than half of them was below high school diploma despite the direct relationships between education level as one of the main social factors of health and displaying healthier behaviors in workplaces (17). In Karimi Aval et al.'s study (28), people with lower education were more likely to get infected with CCHF. In our study, there was a significant relationship between perceived barriers and the use of personal protective equipment. It seems that potential negative factors in adopting healthy behaviors such as high cost of personal protective equipment and its risks and time-consumingness can be an obstacle to adopting healthy behaviors.

In terms of using protective equipment in the workplace, such as suitable workwear, gloves, mask, goggles, and boots, the results demonstrated that more than half of the participants utilized personal protective equipment, but it needs to be mentioned that although various studies have emphasized the role of such equipment in preventing CCHF (26, 29), a substantial number of participants did not use them for personal protection. Likewise, Shahvali et al. (25) reported that slaughterhouse workers and hunters' awareness regarding the nature and transmission routes of CCHF was considerably low. As for other preventive behaviors, the results of the present study revealed that the majority of the participants purchased their household meat from authorized stores, and few were in the habit of eating raw liver (4.83%) or had a history of being bitten by ticks (5.8%), whereas research shows that tick bites and eating habits are amongst the focal transmission routes of CCHF (30, 31). Hence, it can be concluded that the participants performed almost well in this regard. The constructs of the model demonstrated that although more than half of the participants reported acceptable levels of self-efficiency and perceived barriers, only a small proportion displayed appropriate protective behaviors. Likewise, the participants' scores of perceived susceptibility and perceived severity were moderate. The above-mentioned results emphasize the need to pay further attention to health education programs aimed at preventing the transmission of diseases in diverse high-risk occupations.

5.1. Conclusions

Given the serious harmful consequences of CCHF and its vast coverage affecting various occupations and groups of people, the identification of factors affecting preventive behaviors against CCHF could facilitate the design and successful implementation of health improvement programs. In addition, perceived susceptibility was a predictor of CCHF preventive behaviors; thus, it is suggested that future plans and programs based on the HBM should emphasize increasing perceived susceptibility and other constructs of this model to improve the disease-preventing behaviors of butchers.

Footnotes

Authors' Contribution: Zeynab, Abedin Saghafipour co-designed the study. Abedin Saghafipour, Zeynab Karimi, and Shadi Fathizadeh were the project designers of the research and wrote the manuscript. Abedin Saghafipour and Zabihollah Gharlipour participated in collecting the data, and Zabihollah Gharlipour and Samaneh Abolkheirian analyzed the results. All the authors read, modified, and approved the final version of the manuscript.

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