



دانش، نگرش و عملکرد دانش جویان دانشگاه جامی، هرات، افغانستان در مورد تب خونریزی دهنده کریمه-کنگو

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چکیده	اطلاعات مقاله
زمینه و هدف: تب خونریزی دهنده کریمه-کنگو (CCHF) یک بیماری شدید ویروسی منتقله از طریق کنه با میزان مرگ و میر بالا است که در ۵۰ کشور بومی است. در افغانستان، به ویژه در هرات، CCHF یک چالش بزرگ برای سلامت عمومی محسوب می شود، به طوری که ۱۵۳۷ مورد مشکوک گزارش شده و آگاهی در میان جمعیت های پرخطر محدود است. روش بررسی: یک مطالعه مقطعی از اوت تا اکتبر ۲۰۲۴ در دانشگاه جامی، هرات، افغانستان انجام شد. با استفاده از روش نمونه گیری تصادفی طبقه بندی شده، ۳۵۰ دانش جو از طریق یک پرسش نامه خودگزارشی مورد بررسی قرار گرفتند. این مطالعه به ارزیابی دانش، نگرش و عمل کرد (KAP) دانش جویان درباره CCHF پرداخته که شامل سؤالاتی درباره انتقال، علائم، پیش گیری و درک فردی از خطر می باشد. یافته ها: تنها ۲۳،۱٪ از شرکت کنندگان این بیماری را به عنوان یک بیماری قابل انتقال تشخیص دادند، ۳۹،۴٪ از ماهیت ویروسی آن آگاه بودند، ۶۳،۴٪ نیش کنه را به عنوان مسیر انتقال شناسایی کردند، اما تنها ۲۹،۷٪ از انتقال از طریق گوشت حیوان یا ترشحات آن اطلاع داشتند. در مورد نگرش ها، ۹۴،۶٪ CCHF را خطرناک دانستند و ۷۳،۴٪ خود را در معرض خطر احساس کردند. از نظر عمل کرد، ۷۹،۷٪ به طور مداوم به دنبال مشاوره پزشکی بودند، اما فقط ۴۱،۴٪ همیشه از تماس با خون یا گوشت حیوانات آلوده اجتناب می کردند. دانش جویان طب نسبت به دانش جویان غیرطبی دانش بهتری داشتند (۳۶،۱٪) و نگرش مثبت تری نشان دادند (۴۶،۲٪). نتیجه گیری: این مطالعه نشان داد که آگاهی از CCHF در میان دانش جویان دانشگاهی کم است، به ویژه در بین دانش جویان غیرطبی. یافته ها بر لزوم مداخلات آموزشی هدفمند، آموزش های عملی پیش گیرانه، و پرداختن به موانع روانی-اجتماعی برای بهبود راهبردهای پیش گیری از بیماری تأکید دارد.	نوع مقاله: پژوهشی تاریخ دریافت: ۱۴۰۳/۰۸/۲۵ تاریخ پذیرش: ۱۴۰۳/۱۲/۲۶ تاریخ نشر: ۱۴۰۴/۰۱/۳۰ *شناخت نامه نویسنده مسؤول: محمد مسعودی پوهنځی/ دانش کده طب، پوهنتون/ دانش گاه جامی، هرات، افغانستان ✉ mhmasoudy313@gmail.com کد اخلاقی مقاله (صادر شده از سوی معاونیت تحقیقات علمی جامی): J.2024.1.27.5 کد اختصاصی مقاله DOI: https://doi.org/10.58342/ghalibMj.V.2.I.1.2

واژه گان کلیدی: CCHF، دانش، نگرش، عمل کرد، دانش جویان دانش گاه، افغانستان

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Knowledge, attitude, and practices regarding Crimean Congo hemorrhagic fever among students at Jami university, Herat, Afghanistan

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Abstract

Background: CCHF is a severe tick-borne viral disease with a high fatality rate, endemic in 50 countries. In Afghanistan, particularly in Herat, CCHF poses a significant public health challenge, with 1,537 suspected cases and limited awareness among high-risk populations.

Methods: A cross-sectional study was conducted at Jami University in Herat, Afghanistan, from August to October 2024. Using stratified random sampling, 350 students were surveyed through a self-administered questionnaire. The study assessed students' KAP regarding CCHF, with questions covering transmission, symptoms, prevention, and personal risk perception.

Results: Only 23.1% recognized it as transmissible, and 39.4% knew it was viral, while 63.4% identified tick bites as a transmission route, but only 29.7% were aware of transmission through animal meat or secretions. Attitudes showed that 94.6% considered CCHF dangerous, and 73.4% felt personally at risk. In terms of practices, 79.7% consistently sought healthcare advice, yet only 41.4% always avoided contact with infected animal blood or meat. Medical students displayed significantly better knowledge (36.1%), and more positive attitudes (46.2%) compared to non-medical students.

Conclusion: The study highlighted substantial gaps in CCHF awareness among university students, with variations between medical and non-medical students. The findings underscore the need for targeted educational interventions, practical preventive training, and addressing psychosocial barriers to improve disease prevention strategies.

Key words: CCHF, KAP, University Students, Afghanistan

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Introduction

Crimean-Congo Hemorrhagic Fever (CCHF) is a severe tick-borne viral disease caused by Nairovirus, a member of the Bunyaviridae family^[1,2]. It is characterized by sudden-onset fever, headache, myalgia, and gastrointestinal symptoms, often progressing to severe hemorrhagic manifestations^[3], with a high case fatality rate (CFR) of 5–50%, depending on the availability and quality of healthcare services^[4]. The disease was first identified in the Crimea region of the former Soviet Union in 1944 and later in the Congo region in 1969, leading to its renaming as CCHF^[5]. CCHF is endemic in 50 countries, including Africa, the Middle East, Eastern Europe, and Asia^[6], with the World Health Organization (WHO) identifying it as a significant emerging global health threat owing to its potential for widespread outbreaks^[7]. Globally, approximately 3,400 cases are reported annually, with actual numbers likely higher because of underreporting in resource-limited settings^[8].

CCHF is a significant public health issue in Afghanistan, especially in areas such as Herat, where recurrent outbreaks and increasing incidence rates have been observed in recent years. Reports indicate that 1,537 suspected CCHF cases are recorded across the country, with the highest number of cases and fatalities occurring in the western region^[9]. A study in Herat documented a CFR of 22% during a 2017 outbreak, emphasizing the severity of the disease and urgent need for preventive measures^[10]. Herat's status as an agricultural hub, where human-animal interactions are frequent, contributes significantly to the risk of transmission. Furthermore, cultural practices, such as the widespread slaughtering of animals during Eid-al-Adha, compound these risks by increasing contact with potentially infected animal blood and tissue^[11]. Afghanistan's proximity to other endemic regions, including Pakistan and Iran, further exacerbates the risk of cross-border transmission^[12].

CCHF transmission occurs primarily through bites from infected *Hyalomma* ticks or through direct contact with infected blood or body fluids from animals or humans^[13]. Secondary human-to-human transmission can occur in healthcare settings owing to inadequate infection control measures, putting healthcare workers (HCWs) and students in medical and related disciplines at heightened risk. Studies in similar endemic regions highlight critical gaps in knowledge, attitudes, and practices (KAP) related to CCHF, particularly among high-risk populations, such as healthcare professionals and students^[14]. Despite its endemic presence, awareness of CCHF is notably lacking among the general public and high-risk occupational groups such as farmers, abattoir workers, and healthcare professionals, contributing to its continued transmission and spread^[15–17]. A study conducted in Baluchistan, Pakistan revealed that 66% of healthcare workers had inadequate knowledge of CCHF transmission, with significant gaps in the use of personal protective equipment (PPE)^[18]. Similarly, research from Iran found that, while healthcare workers were generally aware of the disease, their compliance with preventive measures, such as wearing gloves and masks when handling suspected cases, was insufficient^[19]. In Afghanistan, limited studies on the subject suggest even lower levels of awareness and preparedness among vulnerable groups^[20].

University students, particularly those studying medicine, veterinary science, and public health, represent a critical demographic to address these gaps. As future professionals, their knowledge of and attitudes towards CCHF are essential to fostering community awareness and implementing preventive strategies. A 2016 study from Zahedan University in Iran found that students' knowledge about CCHF was moderate, with significant gaps in their understanding of preventive measures and transmission routes^[21]. Similarly, nursing students in Turkey exhibited moderate knowledge levels, with notable deficiencies in areas such as protective behaviors and risk perception^[22]. In Herat, Afghanistan, Jami University serves as a prominent educational institution that draws students from diverse backgrounds. Assessing the KAP of these students concerning the CCHF offers valuable insights into the effectiveness of existing awareness campaigns and educational initiatives. Furthermore, it identifies areas requiring targeted interventions to improve disease prevention and control measures at both individual and community levels.

This study aimed to evaluate the knowledge, attitudes, and practices of CCHF among students at Jami University. By focusing on this specific demographic, this research seeks to bridge knowledge gaps, enhance public health strategies, and contribute to a more informed and prepared community. Additionally, these findings will serve as a basis for comparison with similar studies in other endemic regions, offering a broader perspective on the global fight against CCHF. Through this study, we hope to provide actionable recommendations for policymakers, educators, and public health practitioners in Afghanistan and beyond.

Methods

Study Design, Place, and Duration

This cross-sectional study was conducted with students at Jami University, located in Herat City, Afghanistan, between August and October 2024. The study design allowed for the collection of data at a single point in time, providing a snapshot of the student population's mental and physical health status during the study period.

Sample Size

The sample size for this study was calculated using a statistical formula designed to accommodate a specified margin of error and desired confidence level. The formula used was:

$$n = \frac{z^2 p(1 - p)}{e^2}$$

Where:

n is the sample size,

z represents the critical value for the desired confidence level (1.96 for a 95% confidence interval),

p is the estimated proportion of the population with the characteristic in question (in this case, unknown and assumed to be 0.05),

e represents the margin of error, which was set at 0.04.

Using this formula and adjusting for the population of 1,726 students, the minimum sample size required was calculated to be 315. To account for variability and potential dropout, 10% more participants were included, resulting in a total of 347. After rounding during the implementation of the stratified random sampling technique, the final sample comprised 350 students. This stratification ensured that the sample accurately represented the demographics of the broader student population at Jami University, which comprised approximately 1,726 students.

Sampling Procedures and Eligibility Criteria

This study targeted all students enrolled in the spring of 2023 at Jami University. Students fluent in Persian (Dari) provided informed consent. A sampling frame was developed using university attendance records. The total student population was divided by the calculated sample size, and a stratified random sampling method proportional to school size, sex, and academic class was employed to select participants. The data were collected using a self-administered questionnaire.

Questionnaire development

The questionnaire was adopted after an intensive review of the literature^[13,23–26] and reviewed by a research committee comprising senior epidemiologists and physicians with relevant research experience. After discussion and review, the authors completed the questionnaire. A pilot study was then conducted with 30 participants to check the reliability of the questionnaire, where the Cronbach alphas of knowledge, attitudes, and practices were 0.896, 0.925, and 0.762, respectively, which is well accepted in its conventional thresholds. Finally, a questionnaire was distributed to the participants to collect their responses. The questionnaire comprised an introductory paragraph clarifying the aim and objectives of the study, followed by mandatory informed consent for all participants, and then four sections assessing socio-demographics, knowledge, attitudes, and practices.

Sociodemographic information: The sociodemographic section consisted of six questions, including gender, age, marital status, education, residence, and monthly income. After the socio-demographic section, there were four other questions: Have you handled livestock in the past year? Do you know anyone who has been infected with CCHF? Have you ever used insect repellents or tick-prevention measures? and have you attended any CCHF or infectious disease awareness session.

Knowledge regarding CCHF: The Knowledge section consisted of 13 questions. The correct answer was coded as 1, whereas the wrong answer was coded as 0. The total score was obtained by summing the raw

score of each item and ranged from 0 to 13, with an overall higher score indicating more accurate knowledge. A cutoff level of $\geq$ median was set to categorize good knowledge.

Attitudes towards CCHF: The attitude section consisted of 13 questions. The correct answer was coded as 1, whereas the wrong answer was coded as 0. The total score was obtained by summing the raw score of each item and ranged from 0 to 13, with an overall higher score indicating a more appropriate attitude. A cut-off level of $\geq$ median was used to categorize high attitude.

Practices regarding CCHF: The practice section consisted of 13 questions, and the response to each question was indicated on a 5-point Likert scale as follows: 1 (“*Always*”), 2 (“*Mostly*”), 3 (“*Sometimes*”), 4 (“*Rarely*”), and 5 (“*Never*”). The total score was calculated by summing the raw scores of the five questions, ranging from 13 to 65, with an overall higher score indicating higher practices towards CCHF. A score $\geq$ median was calibrated as a high practice for CCHF.

Data Analysis

Data were analyzed using SPSS version 27. Continuous variables with a normal distribution are presented as mean $\pm$ standard deviation ($x \pm s$). Non-normally distributed variables are shown as medians and interquartile ranges (IQR). The scores were dichotomized using the median to facilitate comparisons. Chi-square tests were used to explore the association between socio-demographics, knowledge, attitude, and practice. Statistical significance was set at $P \leq 0.05$.

Ethical Considerations

The study protocol was reviewed and approved by the Institutional Review Board, Jami University, Herat, Afghanistan (J.2024.1.27.5). Informed consent was obtained from all the participants before they were enrolled in the study. Participant privacy and confidentiality were maintained throughout the research process in accordance with the Declaration of Helsinki, and ethical guidelines for research involving human subjects were established.

Results

This study surveyed 350 students from Jami University to assess their knowledge, attitudes, and practices regarding CCHF. Most participants were aged 21-24 years (63.1%), 22.3% were aged 17-20 years, and 14.6% were 25 years or older. Most students resided in urban areas (84.9%) and 87.7% were single. Distribution across faculties showed the highest representation from the Medical Faculty (54.9%), followed by economics (15.1%), law (11.1%), theology (10.6%), and engineering (8.3%). Regarding academic standing, 37.4% were first-year students, while smaller percentages were distributed across higher years, with sixth- and seventh-year students each comprising 4.3%. Employment was reported by 29.1% of the students and 70.9% were unemployed. The majority (82.9%) described their economic status as good, with smaller proportions reporting average (12.6%) or poor (4.6%) status. Notably, 69.7% had handled livestock in the past year and 13.7% knew someone infected with CCHF. Preventive practices were relatively common: 75.4% reported using insect repellents or tick prevention measures and 58.3% had attended awareness sessions on CCHF or infectious diseases (Table 1).

Table 1. The sociodemographic status of participants (Herat, Afghanistan, 2024)

Variables		N	%
Age (year)	17-20	78	22.3
	21-24	221	63.1
	25 and above	51	14.6
Residence type	Urban	297	84.9
	Rural	53	15.1
Marital status	Married	43	12.3
	Single	307	87.7
Faculty	Engineering	29	8.3
	Medical	192	54.9
	Economics	53	15.1
	Law	39	11.1
	Theology	37	10.6
Class	First	131	37.4
	Second	64	18.3

	Third	59	16.9
	Fourth	49	14.0
	Fifth	17	4.9
	Sixth	15	4.3
	Seventh	15	4.3
Occupation	Yes	102	29.1
	No	248	70.9
Economic status	Good	290	82.9
	Average	44	12.6
	Poor	16	4.6
Have you handled livestock in the past year?	Yes	244	69.7
	No	106	30.3
Do you know anyone who has been infected with CCHF?	Yes	48	13.7
	No	302	86.3
Have you ever used insect repellents or tick-prevention measures?	Yes	264	75.4
	No	86	24.6
Have you attended any CCHF or infectious disease awareness sessions	Yes	204	58.3
	No	146	41.7
Total		350	100.0

A knowledge assessment regarding CCHF revealed varying levels of awareness among students at Jami University. While 44.0% correctly identified CCHF as first characterized in the Crimean region, only 23.1% recognized it as a transmissible disease. Awareness of the viral cause of CCHF was noted in 39.4% of participants. Knowledge about transmission was moderate, with 63.4% being aware of tick-bite transmission and 29.7% identifying contact with infected animal meat or secretions as a mode of spread. Notably, 44.9% knew that Herat reported the highest number of CCHF cases in Afghanistan and 52.0% recognized summer as the most suitable season for its spread. Awareness of high-risk groups, such as livestock workers, slaughterhouse workers, and farmers, was 42.3%. Over half (54.3%) were familiar with common symptoms, such as sudden fever, headache, and muscle pain, while 52.9% incorrectly believed that animals infected with the virus always showed symptoms. Preventive measures, such as screening animals for ticks, were correctly identified by 85.4% of respondents. Misconceptions were apparent: 60.0% believed that CCHF was completely curable, while 56.9% were aware that no vaccine currently exists for the disease (Table 2).

Table 2. Knowledge of CCHF among university students (Herat, Afghanistan, 2024)

Variables	Correct (%)
CCHF was first characterized in the Crimean region.	44.0
CCHF is a transmissible disease.	23.1
The causative factor of CCHF is a virus.	39.4
CCHF can spread to humans through infected tick bites.	63.4
CCHF can spread through contact with infected animal meat or secretions.	29.7
The highest number of CCHF cases in Afghanistan are reported in Herat.	44.9
The most suitable season for the spread of CCHF is summer.	52.0
People most at risk of CCHF include livestock workers, slaughterhouse workers, and farmers.	42.3
Common symptoms of CCHF include sudden fever, headache, and muscle pain.	54.3
Animals infected with the CCHF virus always show symptoms.	52.9
Screening animals for ticks can help prevent the spread of CCHF.	85.4
CCHF is a completely curable disease.	60.0
There is currently no vaccine available for CCHF.	56.9
Overall score: median (IQR) = 46.15 (38.46, 61.53)	

The attitude assessment of CCHF among students at Jami University highlighted a generally high level of concern and awareness of the disease. The vast majority (94.6%) recognized CCHF as a dangerous disease, and 73.4% felt personally at risk of contracting it. However, only 5.4% believed in an increased risk of

CCHF cases during Eid-ul-Adha, despite 92.3% acknowledging that livestock movement during holidays raises the risk of disease spread. Most students (90.0%) believed that the effectiveness of screening animals for ticks was a preventive measure. Regarding transmission, 71.7% thought that skin contact with an infected person could spread CCHF and 69.7% agreed that consuming meat from an infected animal poses a risk. While 92.9% believed that immediate medical attention improved recovery, only 14.9% emphasized the need for hospitalization if a family member was infected. Notably, 90.9% expressed confidence in spiritual or traditional healers as effective treatment options, indicating a significant reliance on non-medical approaches. Awareness programs were deemed necessary by 81.7%, and 93.7% trusted government initiatives to control the CCHF. Additionally, 65.7% rejected the misconception that the CCHF only affects rural populations (Table 3).

Table 3. Attitude of CCHF among university students (Herat, Afghanistan, 2024)

Variables	Correct (%)
I believe that CCHF is a dangerous disease.	94.6
I feel that I am personally at risk of getting CCHF.	73.4
I believe there is an increased risk of CCHF cases during Eid-ul-Adha.	5.4
Screening animals for ticks is effective in preventing CCHF.	90.0
I believe CCHF can spread from an infected person to a healthy person through skin contact.	71.7
Eating meat from an infected animal can cause CCHF.	69.7
If someone in my family gets CCHF, they should be admitted to a healthcare facility.	14.9
Immediate medical help increases the chances of recovery from CCHF.	92.9
Spiritual or traditional healers can effectively treat CCHF.	90.9
Awareness programs are necessary to reduce the spread of CCHF.	81.7
CCHF is a disease that only affects people living in rural areas.	65.7
I believe livestock movement during Eid-ul-Adha increases the risk of CCHF spread.	92.3
I trust that government initiatives can effectively control the spread of CCHF.	93.7
Overall score: median (IQR) = 76.92 (61.53, 84.61)	

The practice assessment of CCHF among students at Jami University indicated varying adherence to preventive behaviors. The majority (79.7%) consistently consulted healthcare professionals for CCHF-related information, while 63.4% always took precautions when handling animals during Eid-ul-Adha. Screening animals for ticks was a regular practice for 67.1%, and 69.4% always washed their hands thoroughly after handling them. Protective gear use, such as gloves and masks, was reported by 65.1% of participants as a consistent habit. However, direct contact with the blood or meat of infected animals was always avoided by only 41.4%, suggesting a gap in adherence to critical preventive measures. Regarding self-education, 59.1% regularly sought information about CCHF from reliable sources and 73.7% actively participated in community awareness programs. Practices related to environmental management showed that 50.6% consistently ensured that livestock were kept in tick-free environments and 50.3% supported initiatives to vaccinate animals against ticks carrying CCHF. Half of the respondents (50.3%) always encouraged others to follow proper livestock handling precautions, and 56.6% consistently reported suspected cases to the authorities. In addition, 54.9% avoided purchasing livestock from unverified sources. These findings highlight areas of strong preventive practices, while underscoring opportunities for improved adherence to critical measures.

Table 4. Practice of CCHF among university students (Herat, Afghanistan, 2024)

Practice	Always	Mostly	Sometimes	Rarely	Never
	%	%	%	%	%
I consult doctors or healthcare professionals for information on CCHF.	79.7	11.4	6.9	1.4	.6
I take precautions when handling animals during Eid-ul-Adha.	63.4	24.0	10.9	1.4	.3
I ensure that animals are screened for ticks before handling them.	67.1	17.4	12.0	2.9	.6
I avoid direct contact with the blood or meat of infected animals.	41.4	21.7	22.3	10.3	4.3
I regularly educate myself about CCHF from reliable sources.	59.1	15.4	16.9	5.1	3.4
I ensure that livestock is kept in tick-free environments.	50.6	18.3	20.3	8.0	2.9
I wear protective gear (gloves, masks) when handling	65.1	20.3	10.9	2.9	.9

animals.					
I wash my hands thoroughly after handling animals.	69.4	16.3	11.4	2.0	.9
I actively participate in community programs aimed at CCHF awareness.	73.7	12.6	11.1	1.4	1.1
I encourage others to follow proper precautions when handling livestock.	50.3	18.6	20.0	8.6	2.6
I report suspected CCHF cases to the authorities.	56.6	23.1	14.3	5.1	.9
I support initiatives to vaccinate animals against ticks carrying CCHF.	50.3	22.6	18.9	7.4	.9
I avoid purchasing livestock from unknown or unverified sources.	54.9	20.6	11.1	7.4	6.0
Overall score: median (IQR) = 15.38 (7.69, 25.00)					

In terms of knowledge, faculty affiliation was the only factor significantly associated with high knowledge levels. Medical students exhibited significantly higher knowledge (36.1%) than non-medical students (24.0%; $P=0.013$). Regarding attitude, a similar trend was observed for faculty affiliation. Medical students demonstrated significantly more positive attitudes (46.2%) than non-medical students (18.8%) ($P<0.001$). In practice, these two factors showed significant associations. Participants who knew someone infected with CCHF had significantly lower practice levels (33.3%) than those who did not (48.7%) ($P=0.048$). Additionally, those who used insect repellents or tick prevention measures had significantly higher practice levels (46.6%) than those who did not (46.5%) ($P=0.047$).

Table 4. Univariate Analysis of CCHF Knowledge, Attitude, and Practice among university students (Herat, Afghanistan, 2024)

Variables		High Knowledge (%)	P-Value	High Attitude (%)	P-Value	High Practice (%)	P-Value
Age (year)	17-20	37.2	0.218	37.2	0.056	51.3	0.184
	21-24	26.7		32.1		47.5	
	25 and above	29.4		17.6		35.3	
Residence type	Urban	27.6	0.077	32.7	0.147	46.1	0.694
	Rural	39.6		22.6		49.1	
Marital status	Married	30.2	0.902	34.9	0.572	34.9	0.694
	Single	29.3		30.6		48.2	
Faculty	Non-Medical	24.0	0.013	18.8	<0.001	43.8	0.243
	Medical	36.1		46.2		50.0	
Class	First or Second	30.3	0.922	30.3	0.138	51.3	0.134
	Third or Fourth	28.7		37.0		39.8	
	Fifth, Sixth, Seventh	27.7		21.3		42.6	
Occupation	Yes	31.4	0.609	24.5	0.086	46.1	0.906
	No	28.6		33.9		46.8	
Economic status	Good	30.0	0.784	31.4	0.374	46.2	0.944
	Average	25.0		25.0		47.7	
	Poor	31.3		43.8		50.0	
Have you handled livestock in the past year?	Yes	30.3	0.575	30.3	0.617	47.1	0.750
	No	27.4		33.0		45.3	
Do you know anyone who has been infected with CCHF?	Yes	33.3	0.523	29.2	0.750	33.3	0.048
	No	28.8		31.5		48.7	
Have you ever used insect repellents or tick-prevention measures?	Yes	29.9	0.721	33.0	0.118	46.6	0.047
	No	27.9		25.6		46.5	
Have you attended any CCHF or infectious disease awareness sessions	Yes	27.9	0.470	31.9	0.731	47.1	0.829
	No	31.5		30.1		45.9	

Table 6. Spearman's Correlation Between Knowledge, Attitude, and Practice

Variables	Knowledge	Attitude	Practice
Knowledge	r = 1.000 —	r = 0.164 p = 0.002**	r = 0.025 p = 0.643
Attitude	r = 0.164 p = 0.002**	r = 1.000 —	r = -0.105 p = 0.049*
Practice	r = 0.025 p = 0.643	r = -0.105 p = 0.049*	r = 1.000 —

Table 6 illustrates Spearman's correlation between knowledge, attitude, and practice regarding Hepatitis B among healthcare workers. The analysis revealed a weak positive correlation between knowledge and attitude ($r = 0.164$, $P = 0.002$), indicating that higher knowledge levels were associated with a slightly more positive attitude towards Hepatitis B prevention. This correlation is statistically significant at the 0.01 level, suggesting that knowledge plays a minor but meaningful role in shaping attitudes. Conversely, there was a weak negative correlation between attitude and practice ($r = -0.105$, $P = 0.049$), which was statistically significant at the 0.05 level. This finding implies that a more positive attitude is slightly linked to lower adherence to preventive practices, although the strength of this relationship is minimal. No significant correlation was observed between knowledge and practice ($r = 0.025$, $P = 0.643$), indicating that increased knowledge does not directly translate into better practice behaviors. These results highlight the complexity of the relationship between knowledge, attitudes, and practice, emphasizing that knowledge alone may not be sufficient to improve adherence to preventive measures. This underscores the need for targeted interventions that address both attitudes and practical barriers to effective infection control (Table 6).

Discussion

A knowledge assessment at Jami University revealed that 44.0% of respondents correctly identified the Crimean region as the origin of CCHF, but only 23.1% recognized it as a transmissible disease. These results partially align with global findings that demonstrate persistent gaps in foundational knowledge regarding the disease. Ahmed et al. found that 40% of healthcare students in Pakistan were unaware of CCHF's zoonotic nature of CCHF, highlighting the widespread lack of awareness^[13]. Similarly, Gorgich et al. reported that only 35% of medical students in Iran identified CCHF as a viral disease, indicating a limited understanding of its epidemiology^[21]. These findings suggest that the basic knowledge gaps regarding the origin and nature of CCHF are consistent across regions.

The modest 39.4% awareness of CCHF's viral cause in our study echoes the patterns seen in Salimi et al., which documented similar gaps in understanding among Iranian healthcare workers^[19]. These findings reinforce the need for foundational public health education that focuses on zoonotic diseases.

Knowledge about tick-borne transmission was relatively high in our study, with 63.4% of respondents identifying this as the primary mode of CCHF spread. This aligns with studies such as Ahmed et al., who reported that 70% of students in Pakistan recognized tick-borne transmission as the most prominent route^[24]. Similarly, Rahnavardi et al. observed 75% awareness of tick transmission among healthcare workers in Iran^[14]. However, the awareness of transmission through animal meat or secretions was low (29.7%). This result lags behind the findings of Hatami et al., where 42% of Iranian healthcare workers identified risks related to contact with animal products^[20]. These disparities suggest that, while tick-borne transmission is widely recognized, there is a lack of emphasis on other routes of infection in educational efforts.

Awareness of seasonal risk factors, with 52.0% recognizing summer as the peak season for CCHF, demonstrated a moderate understanding. This is consistent with Taqi et al., where 60% of the respondents in Iraq identified summer as the primary transmission period^[27]. Similarly, 44.9% of our respondents were aware of Herat's prominence as a CCHF hotspot, a finding echoed by Ali et al. who noted localized knowledge about endemic zones in Pakistan^[24]. These results suggest that, while contextual knowledge about seasonal and geographic risk exists, there is room for improvement in raising awareness of region-specific patterns.

Our research highlighted 42.3% awareness of high-risk groups, such as farmers and slaughterhouse workers, and 54.3% familiarity with common symptoms such as fever and headache. These results are comparable to those of Fletcher et al., who found that 50% of the healthcare workers in Eurasia identified occupational risk groups^[28]. However, misconceptions were evident, with 52.9% believing that animals infected with CCHF always exhibited symptoms. This is similar to the findings of Jamil et al., in which 55%

of participants held this false belief ^[8]. These results suggest that misconceptions about the presentation of the disease remain prevalent even among educated populations.

Preventive behaviors were well recognized, with 85.4% identifying tick screening as a vital measure, surpassing the 70% reported in a similar study by Rahnavardi et al., where 70% were aware of practical prevention techniques ^[14]. However, misconceptions about CCHF being fully curable persisted among 60% of respondents, higher than the 45% reported in another study ^[24]. These findings highlight the need for targeted campaigns to address specific knowledge gaps and to reduce misinformation.

Our study revealed a significant level of concern among students, with 94.6% recognizing CCHF as a dangerous disease and 73.4% feeling at risk. These findings were consistent with those of other studies conducted in endemic regions. Ahmed et al. reported that 91% of healthcare students in Pakistan acknowledged the severity of CCHF and viewed it as a major health threat ^[13]. Similarly, Salimi et al. found that 88% of Iranian healthcare workers identified CCHF as a serious public health concern ^[19]. Jamil et al. observed that 85% of Pakistani participants felt vulnerable to zoonotic diseases, including CCHF, indicating widespread awareness of personal risk ^[8]. However, only 5.4% of the students in our study recognized an increased risk of CCHF during Eid-ul-Adha despite 92.3% acknowledging livestock movement as a potential driver of disease spread. Similarly, Fletcher et al. highlighted a surge in CCHF cases associated with cultural practices during festivals involving animal sacrifices ^[28]. This discrepancy suggests that cultural beliefs or a lack of targeted awareness programs may downplay event-specific risks in our study population.

We found that 71.7% of students believed that skin contact with infected individuals is a key transmission route, and 69.7% associated consuming infected meat with the spread of CCHF. These perceptions are consistent with studies by Rahnavardi et al., where 75% of healthcare workers in Iran identified direct contact as a significant mode of transmission ^[14]. Similarly, Hatami et al. found that 70% of participants in Iran recognized animal products as a transmission risk ^[20]. The widespread support for preventive measures, such as tick screening (90.0%), underscores the growing awareness about vector control. This aligns with the findings of Safieyan et al., where 85% of Iranian respondents endorsed vector control measures as critical for CCHF prevention ^[29]. The strong support for practical strategies, such as tick screening, suggests that populations in endemic areas readily adopt such measures, provided that the importance is communicated effectively.

The finding that 90.9% of the students expressed confidence in spiritual or traditional healers highlights a significant reliance on non-medical approaches. This finding contrasts with the results of studies conducted in other regions. Ali et al. found that only 35% of Pakistani students supported traditional healing methods, indicating a stronger preference for clinical care ^[24]. Similarly, Jamil et al. reported that 70% of the participants preferred modern medical treatment over alternative options ^[8]. In contrast, only 14.9% of the students in our study emphasized the importance of hospitalization for infected family members, which was significantly lower than the 65% observed by Salimi et al., where professional medical care was a priority ^[19]. This heavy reliance on traditional healers in our population may be driven by cultural influences or mistrust in formal health care systems. Such preferences could delay effective medical interventions and exacerbate the spread of the disease.

We found that 93.7% of the students trusted government initiatives to control CCHF, a promising finding that mirrors trends in other endemic regions. Similarly, Fletcher et al. observed that 90% of respondents believed in the effectiveness of state-led campaigns to combat zoonotic diseases ^[28]. Additionally, the rejection of the misconception that CCHF primarily affects rural populations by 65.7% of our respondents reflects improved awareness compared with Taqi et al., where only 50% of participants rejected this myth ^[27]. These findings suggest that efforts to communicate the broad risks of CCHF had a positive impact on our study population.

Our findings showed that 79.7% of the students consistently consulted healthcare professionals for CCHF-related information, which is higher than the results of other studies. For example, Ahmed et al. found that only 62% of Pakistan's healthcare students frequently sought professional advice on zoonotic diseases, indicating better engagement among our respondents ^[13]. Similarly, Jamil et al. reported that 68% of participants consulted healthcare professionals for reliable information, underscoring the comparatively higher reliance on professionals in our study population ^[8]. Regarding specific preventive practices, 63.4% of the respondents in our study took precautions during Eid-ul-Adha, while 67.1% regularly screened animals for ticks. These findings are consistent with Taqi et al., who observed that 60% of Afghan respondents recognized the importance of preventive measures during animal-related festivals ^[27]. Similarly, Rahnavardi et al. noted that 65% of Iranian participants regularly practice tick screening ^[14]. However, only 41.4% of our respondents consistently avoided contact with infected blood or meat, which is notably lower than the 55% avoidance rate observed by Fletcher et al. (28) among Eurasian healthcare workers ^[28].

This lower adherence to critical measures, such as avoiding the blood or meat of infected animals, highlights challenges in translating knowledge into action, potentially due to inadequate risk perception or practical difficulties in implementation.

The adherence rates of 69.4% for handwashing and 65.1% for protective gear use (e.g., gloves and masks) in our study are encouraging and comparable to global trends. Ahmed et al. reported that 68% of participants in Pakistan used protective gear while handling livestock, reflecting similar preventive habits^[24]. However, the lower adherence to avoiding direct contact with infected blood or meat mirrors the findings of Hatami et al., where 40% of healthcare workers failed to consistently avoid direct contact despite understanding the risks^[20]. This suggests that while general hygiene practices are well adopted, critical measures addressing high-risk behaviors require further emphasis.

Our results showed strong community engagement, with 73.7% of respondents participating in awareness programs and 56.6% consistently reporting suspected cases to the authorities. These findings are comparable to those of Salimi et al., who observed 75% active participation in awareness initiatives among healthcare professionals^[19]. However, only 50.6% of the respondents ensured tick-free livestock environments, and 50.3% supported vaccination initiatives, reflecting moderate engagement. These levels are slightly lower than those reported by Safieyan et al., where 60% of participants actively managed livestock environments in Iran^[29], and Taqi et al. (2021), who found 55% support for livestock vaccination efforts^[27]. These findings indicate a gap in environmental management practices, possibly owing to logistical barriers or limited awareness of their importance in CCHF prevention.

Our study found that 59.1% of students engaged in self-education about CCHF and 50.3% encouraged others to follow safe practices. These rates align with the findings of Ali et al., where 55% of participants actively shared information about zoonotic diseases^[24]. Similarly, Jamil et al. reported that 60% of respondents proactively sought reliable resources for self-education, reflecting slightly higher engagement levels^[19]. These moderate rates of self-education and peer encouragement highlight the opportunity to promote a culture of peer-driven awareness and reinforce the importance of collective responsibility in disease prevention.

Our study's finding that medical students (36.1%) demonstrated higher knowledge about CCHF than non-medical students (24.0%), with faculty type as the only significant factor, contrasts with trends reported in other studies. For instance, research in Iran has found that healthcare workers (HCWs) relying on academic resources exhibit higher knowledge levels than those using local media^[14]. Similarly, a study in Iraq reported that 72% of medical students had good knowledge of CCHF, highlighting the impact of formal education^[27]. In Pakistan, healthcare students also performed better in identifying disease transmission risks than their non-medical peers^[30].

Our findings also indicated that medical students (46.2%) demonstrated a more positive attitude towards CCHF than non-medical students (18.8%). This contrasts with global patterns, where healthcare workers and students typically exhibit more favorable attitudes due to their training. For example, in Pakistan, medical students display strong attitudes that correlate with their knowledge levels^[24]. Research also suggests that students with better knowledge are more likely to demonstrate positive attitudes, as seen in a study in Iran. The relationship between preventive practices and personal connections to CCHF as well as the use of insect repellents mirrors the findings of another study. In our study, students who personally knew about CCHF cases were less likely to report high practice levels, a finding that is counterintuitive. Other research has shown that exposure to endemic areas or personal connections often increases preventive behaviors. For instance, HCWs in Iran demonstrated higher engagement in preventive practices in high-risk settings^[19]. A multicenter study across Eurasia emphasized the importance of PPE and hands-on preventive measures to improve practice levels^[28]. The fear and stigma associated with CCHF, particularly for those with personal connections to the disease, may explain the lower practice rate in our study. This underscores the need to address psychological barriers while promoting preventive behaviors.

The contrasting knowledge and attitude levels of medical and non-medical students suggest a critical gap in targeted education for non-medical students. Non-medical students may benefit from broader media-driven exposure to general disease information. The lower practice levels among students personally connected to CCHF cases highlight potential fear or stigma, which can act as a deterrent to active engagement in preventive behaviors. This suggests the dual challenge of increasing awareness and addressing emotional or psychological barriers to ensure effective behavioral responses. Moreover, the association of high practice levels with insect repellents indicates that practical and accessible tools can significantly influence prevention.

Policy Significance and Recommendations

The findings of our study have critical policy implications for public health education and disease prevention strategies.

1. Integrating Public Health Training in Medical Curricula: Introduce comprehensive training on zoonotic diseases, such as CCHF, emphasizing both clinical and preventive measures. Such curricula should foster both a theoretical understanding and practical application.
2. Design-Targeted Awareness Campaigns: Develop campaigns specifically addressing non-medical and medical students using multimedia, workshops, and interactive sessions to engage different learning styles and knowledge baselines.
3. Promote Practical Preventive Measures: Ensure that students are equipped with hands-on training in using insect repellents, PPE, and other preventive tools, particularly in endemic regions.
4. Address psychosocial barriers: Implementation of counseling and support programs for students with personal connections to CCHF to reduce stigma and fear and encourage proactive preventive behaviors.
5. Foster Cross-Disciplinary Collaboration: Encourage partnerships between medical and non-medical faculties to promote holistic understanding and collective action against zoonotic diseases.

By bridging knowledge gaps and addressing psychosocial factors, these recommendations can significantly enhance disease preparedness among students, laying the groundwork for more robust public health responses to CCHF in endemic regions.

Strengths and Limitations

The strengths of this study include its cross-sectional design, which enabled data collection from a diverse sample of university students' settings in Herat, thus enhancing the generalizability of the findings. Additionally, the use of a validated, self-administered questionnaire ensured reliable data collection from the KAP regarding CCHF reporting. The pilot testing and expert review of the questionnaire further ensured the relevance and clarity of the target population. However, this study had several limitations. Convenience sampling may have introduced selection bias, as only available and willing participants were included, potentially affecting the representativeness. Self-reported data can also be susceptible to social desirability bias, with participants potentially over-reporting positive attitudes or practices. Finally, the cross-sectional design provides a snapshot of time, limiting the ability to assess changes or causality. Longitudinal research would be useful for tracking KAP changes over time, especially following training intervention.

Conclusion

This study offers a comprehensive evaluation of university students' understanding of Crimean-CCHF in Herat, Afghanistan, uncovering notable knowledge gaps, particularly among non-medical students, and highlighting the interplay between awareness, attitudes, and preventive practices. Although students generally recognize CCHF as a serious disease, their understanding of its transmission, prevention, and risk factors remains inconsistent, with medical students demonstrating superior knowledge and attitudes, underscoring the importance of specialized medical education. To address these gaps, this study recommends integrating zoonotic disease training into curricula, launching targeted awareness campaigns, promoting practical preventive measures, addressing psychological barriers, and fostering cross-disciplinary collaboration. These measures aim to enhance student preparedness and strengthen public health responses to CCHF in endemic regions, offering valuable insights not only for Herat, but also for similar geographical contexts. Ultimately, the study emphasizes the necessity of bridging knowledge gaps and addressing psychosocial factors to develop effective prevention strategies for zoonotic diseases, such as CCHF.

Conflict of Interest statement

The authors declare that they have no conflicts of interest.

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Authors' Contributions

Mohammad Masudi, Ali Rahimi, Sayed Aref Salehi, Mohammad Hadi Binesh, Said Farooq Hosaini, and Nasar Ahmad Shayan conceptualized the manuscript. Mohammad Masudi, Ali Rahimi, Sayed Aref Salehi, Mohammad Hadi Binesh, Said Farooq Hosaini, and Nasar Ahmad Shayan wrote the original draft.

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