

Epidemiology and Outcomes of Crimean-Congo Hemorrhagic Fever in Afghanistan: A Review of 2010–2019

Kubra Rahmani¹, Raihana Behrad², Ali Rahimi^{3,4}, Sharareh Shayan⁴, Gökçe Uğurlu⁵, Nasar Ahmad Shayan⁶

1. Roshana Eye Hospital, Herat, Afghanistan
2. General Department, Faculty of Medicine, Ghalib University, Herat, Afghanistan
3. Scientific Research Center, Jami University, Herat, Afghanistan
4. Department of Para-clinic, Faculty of Medicine, Jami University, Herat, Afghanistan
5. Department of Public Health, Faculty of Medicine, Hacettepe University, Ankara, Turkey
6. Department of Epidemiology and Biostatistics, Faculty of Medicine, Western University, London, ON, Canada

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*Corresponding Author:

Ali Rahimi
Address: Scientific Research
Center, Jami University, Herat,
Afghanistan

✉ dr.rahimi@outlook.com
Iran

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ABSTRACT

Background: The study investigates the recent surge in Crimean-Congo Hemorrhagic Fever (CCHF) cases in Afghanistan, a high-risk viral disease transmitted through tick bites and livestock, and aims to identify patterns of the increase and offer prevention strategies.

Methods: A systematic review of all scholarly articles published on CCHF in Afghanistan between 2010 and 2019 was conducted using a comprehensive and rigorous search strategy using the PubMed database. The quality of the included studies was assessed using the Newcastle-Ottawa Scale and the Cochrane Risk of Bias Tool.

Results: During the study period, 1537 suspected cases of CCHF were reported in Afghanistan, with the highest number and deaths in the western region. The majority of cases were male, aged 16-84, and involved in animal husbandry, agriculture, and healthcare workers, with a 2:1 male-to-female ratio. The majority of cases were aged 16-84.

Conclusion: This study highlights the need for effective measures to prevent CCHF transmission in Afghanistan, such as education, improved animal management, and infection control in hospitals and laboratories, to reduce outbreak risks and enhance public health.

Keywords: Crimean-Congo Hemorrhagic fever, CCHF, Afghanistan, systematic review, public health.

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1. Introduction

Crimean-Congo hemorrhagic fever (CCHF) is a viral disease transmitted to humans through the bite of infected ticks (1, 2). 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 the renaming of the disease as Crimean-Congo Hemorrhagic Fever (3, 4). The virus responsible for CCHF, called Crimean-Congo Hemorrhagic Fever Virus (CCHFV), was first identified in 1956 (5,6) and is a member of the *Nairoviridae* family, with ixodid ticks being the main carriers of the virus (7–10). Humans can become infected through the bite of an infected tick, contact with the skin or blood of infected animals, or contact with the blood or bodily fluids of infected patients. Risk factors for transmission include working with CCHFV samples in laboratories, working in hospitals where patients with CCHF are being treated, and not following proper infection prevention guidelines (10–17).

Risk factors for transmission include working with CCHFV samples in laboratories, working in hospitals where patients with CCHF are being treated, and not following proper infection prevention guidelines (3). The incubation period is 1–5 days, with a maximum of 9 days in the case of contact with infected blood or tissues (18). The pre-hemorrhagic phase lasts for three days and is characterized by fever (39–41 °C), lethargy, headache, muscle and chest pain, and facial bleeding. The hemorrhagic phase usually begins 3–5 days after disease onset and lasts for 2–3 days, with a mucocutaneous petechial rash being a common manifestation. The convalescent phase begins 10–20 days after the beginning of the infection and may last for up to a year. There is no specific treatment or vaccine for CCHF, and death rates can be high, particularly in severe cases (19–21).

CCHF is a public health concern in Afghanistan, where it is transmitted through ticks and livestock, leading to past outbreaks (22). This disease is particularly prevalent in regions where agricultural activities and animal husbandry are common. In addition to the risk of infection through tick bites

and contact with infected animals, occupational exposure is also a concern for those working in the livestock and agricultural sectors in Afghanistan (22). The first humanitarian incident was reported in 1998 in Takhar Province (19 cases and 12 deaths). In 2000, CCHF occurred in the Golran district of Herat Province, with 25 cases and 15 deaths. No positive CCHF events were reported in Afghanistan until 2007 (1). Between 2007 and 2009, 1,562 cases were reported in Afghanistan (23).

It is important to implement effective control measures to prevent the transmission of CCHF in Afghanistan, including education about the prevention and awareness of the danger of the disease, as well as improved management of infected animals and the implementation of proper infection control measures in hospitals and laboratories. This study aimed to determine the cause of the recent increase in the number of CCHF cases in Afghanistan and provide academic suggestions and approaches for disease prevention. By better understanding the factors contributing to the spread of CCHF in Afghanistan, we can take steps to reduce the risk of outbreaks and improve public health in the region.

2. Materials and Methods

This study is a systematic review of all scholarly articles published on CCHF in Afghanistan between 2010 and 2019. The review was conducted using a comprehensive and rigorous search strategy in the PubMed database, which included the keywords "CCHF" and "Afghanistan." The initial search yielded 31 articles, of which 27 were published between 2010 and 2019.

Following the selection process that involved the assessment of full-text articles, 25 articles were deemed relevant to the current review. Of these, 11 articles met the inclusion criteria and were included in the final analysis. In addition to these 11 articles, three reports on CCHF cases in Afghanistan from 2019 to 2021 were reviewed and included in the study (Figure 1). The authors of the current study

followed a standardized protocol for the selection, assessment, and synthesis of the included studies. The process involved the assessment of the authors, study area, research plan, work method, key findings, and the final results of each study. All the authors of the review participated in the process of selecting, reading, and evaluating the included studies to ensure a high level of rigor and consistency. The data extraction process was carried out independently by two authors, and discrepancies were resolved by consensus. The quality of the included studies was assessed using the Newcastle-Ottawa Scale (NOS) for observational studies and the Cochrane Risk of Bias Tool for randomized controlled trials. The results of the studies were synthesized narratively, with a focus on the occurrence and characteristics of CCHF in Afghanistan. This study is a systematic review of all scholarly articles published on CCHF in Afghanistan between 2010 and 2019. It was based on a comprehensive and rigorous search strategy, and the inclusion of relevant articles was determined through a standardized selection process. The quality of the included studies was assessed, and the results were synthesized narratively to gain a more comprehensive understanding of the occurrence and characteristics of CCHF in Afghanistan.

3. Results

This study aimed to investigate the epidemiological status of Crimean-Congo hemorrhagic fever (CCHF) in Afghanistan between 2010 and 2019 (except for one report from 2021) by systematically reviewing 14 studies and reports. The summary table includes information on the title of the study, authors, year of publication, type of study, sample size, number of confirmed cases by ELISA, percentage of males affected, the age range of affected individuals, and occupation of affected individuals (Table 1). The studies and reports reviewed in this table indicate that CCHF is a significant public health concern in Afghanistan. According to a national surveillance study, 239 of the 1284 cases reported from 2016 to 2018 were confirmed by ELISA.

The majority of affected individuals were male, with the highest male-to-female ratio of 2:1. The age range of the affected individuals varied, with the majority falling between 16 and 44 years old. The occupations of the affected individuals were diverse, with housewives, health staff, shepherds, butchers, students, animal dealers, and farmers being the most affected. It is worth noting that the studies and reports reviewed in this table had different sample sizes and study designs, which may affect the generalizability of the findings. Furthermore, the table also shows that CCHF cases were continuously reported in Afghanistan in 2019, according to the WHO EMRO and the Ministry of Public Health.

3-1. The 2019 Report of the Ministry of Public Health on CCHF

The Ministry of Public Health's 2019 report (currently only available offline) provides information on the number of COVID-19 cases and mortality rates in various provinces in Afghanistan (Figure 2). The provinces with the highest number of cases were Herat and Kabul, with 138 and 137 cases, respectively. However, the mortality rate was the highest in Kunduz, with 6 out of 16 deaths. The province with the lowest number of cases was Parwan, with only 12 cases and two deaths. The provinces included 51 cases and five deaths. The total number of cases in all provinces was 440, with a mortality rate of 50 deaths. Notably, the mortality rate varies greatly among provinces (24).

3-2. The 2019 Eastern Mediterranean Region Report on CCF in Afghanistan

According to the WHO Eastern Mediterranean Regional Office (EMRO) report, in 2019, 359 suspected cases of CCHF were reported in Afghanistan, of which 46 were confirmed to be fatal. Compared to previous years, the number of suspected cases in 2019 was lower than that in 2017 and 2018, which saw a peak of 483 and 245 suspected cases, respectively. However, the number of confirmed deaths in 2019 was higher than that in 2014 and 2015, which saw 2 and 20 confirmed deaths, respectively (23, 25). Overall, based on WHO reports, there were a total of 1537

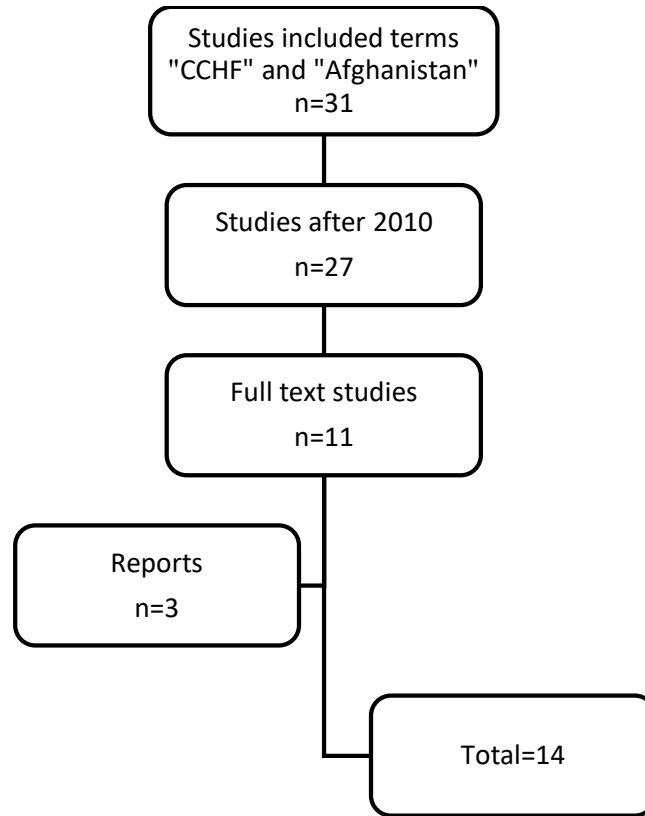


Fig. 1. Search and selection process for CCHF articles included in this study.

suspected cases reported, 491 confirmed cases, and 205 deaths recorded between 2010 and 2019 (23,

25). Figure 3 compares the annual suspected, confirmed, and death cases of CCHF since 2010.

Table 1: Summary of the studies reviewed in this paper, including information such as study design, sample size, and main findings.

Studies	1. Descriptive epidemiology of Crimean-Congo Hemorrhagic Fever (CCHF) in Afghanistan: Reported cases to National Surveillance System, 2016-2018	<u>Mohammad Nadir Sahak et al</u>	2019	Surveillance study/ Descriptive epidemiology study	1284	239	68.5	16-44	housewives (15%), health staff (13%), shepherds (11%), butchers (6%), students (6%), animal dealers and farmers (both 2%)
	2. CCHF virus variants in Pakistan and Afghanistan: Emerging diversity and epidemiology	Adnan Khurshid et al	2015	Descriptive epidemiology study	49	10	-	18-56	-
	3. Complete sequence and phylogenetic characterization of Crimean-Congo hemorrhagic fever virus from Afghanistan	Stephan Olschlager et al	2011	Molecular epidemiology /virology study	-	-	-	-	-

4. Prevalence of Zoonotic and Vector-Borne Infections Among Afghan National Army Recruits in Afghanistan	Catherine S. Todd et al	2016	Prevalence study	809	33	-	18-36	-
5. Investigation of Crimean-Congo hemorrhagic Fever in Patients Admitted to Antani Hospital, Kabul, Afghanistan	<u>Hossein Hatami et al</u>	2019	descriptive study/case-control study	120	29	2:1	10-85	-
6. Crimean-Congo Hemorrhagic Fever, Herat Province, Afghanistan, 2017	<u>Aziz-ur-Rahman Niazi et al</u>	2019	descriptive case series study	63	32	60.3	9-90	Housewife (36.5) Farmer (22.2) Butcher (11.1) Laborer (9.5) Shepherd (4.8) Unemployed (4.8) Waiter (3.2) Engineer (1.6) Student (1.6) Driver (1.6) The security guard (1.6) Shopkeeper (1.6)
7. Crimean-Congo hemorrhagic fever infections reported by ProMED	Yavuz Ince et al	2014	Surveillance study	3426	61	67	-	96 total: 58 were farmers, 21 were HCWs, 12 were butchers, and 5 were leather business workers
8. Crimean-Congo Hemorrhagic Fever (CCHF) in Afghanistan: A retrospective single-center study	Shohra Qaderi	2021	A descriptive and analytic retrospective study	231	51	37	20-50	butchers
9. Consensus report: Preventive measures for Crimean-Congo Hemorrhagic Fever during Eid-al-Adha festival.	Haken Leblebicioglu et al	2015	-	-	-	-	-	-
10. Crimean-Congo hemorrhagic fever virus strains Hoti and Afghanistan cause viremia and mild clinical disease in cynomolgus monkeys	Robert W. Cross	2020	-	-	-	-	-	-
11. Genome Sequence of Ex-Afghanistan Crimean-Congo	John Chamberlain et al	2013	-	1	1	-	38	-

	Hemorrhagic Fever Virus SCT Strain, from an Imported United Kingdom Case in October 2012								
Reports	12. Crimean-Congo hemorrhagic fever in Herat province of Afghanistan, 2007-2021	<u>Aziz-ur-Rahman Niazi et al</u>	2021	Descriptive case series Report	252	-	63.5	-	Housewife (32.9%), Farmer (25.0%), Shepherd (6.7%), Butcher (6.7%), Self-employed (4.8%), Worker (2.0%), Student (1.6%), Security guard (0.4%), Collegian (0.4%), Jobless (0.8%), Other (18.7%)
	13. CCHF cases continuously reported in Afghanistan, in 2019	WHO EMRO	2019	Descriptive case series Report	359	120	-	-	-
	14. Ministry of Public Health Report on CCHF in 2019	Ministry of Public Health	2019	Descriptive case series Report	440	-	-	-	-

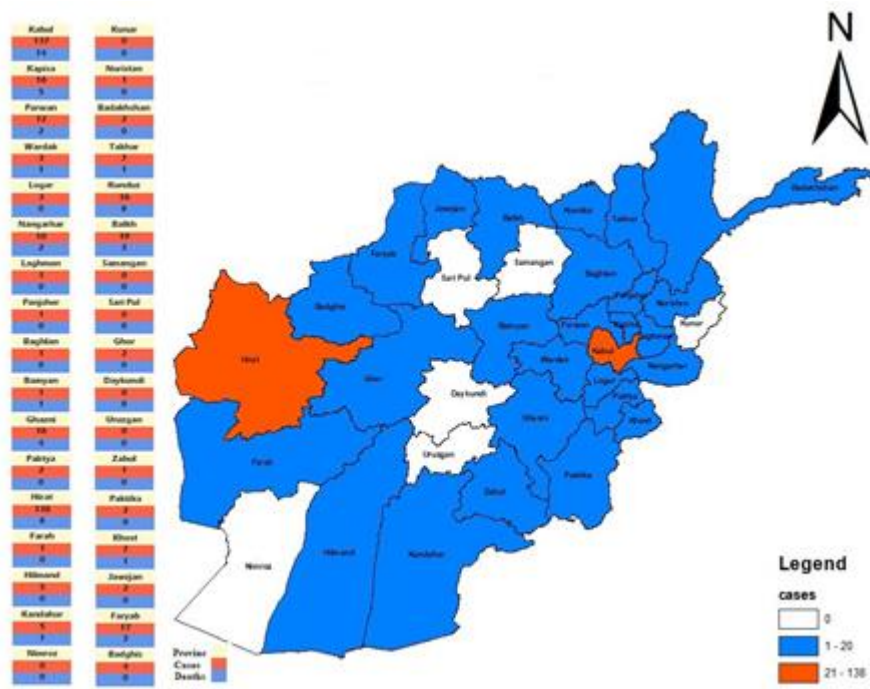


Fig. 2. Geographic distribution of CCHF cases in Afghanistan in 2019 (24).

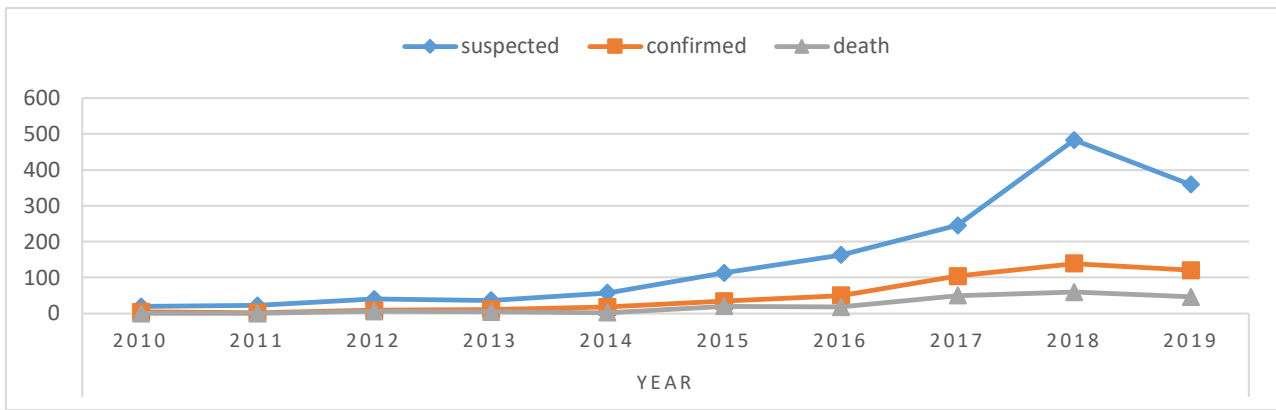


Fig. 3. Number of Suspected, Confirmed, and CCHF Deaths between 2010-2019.

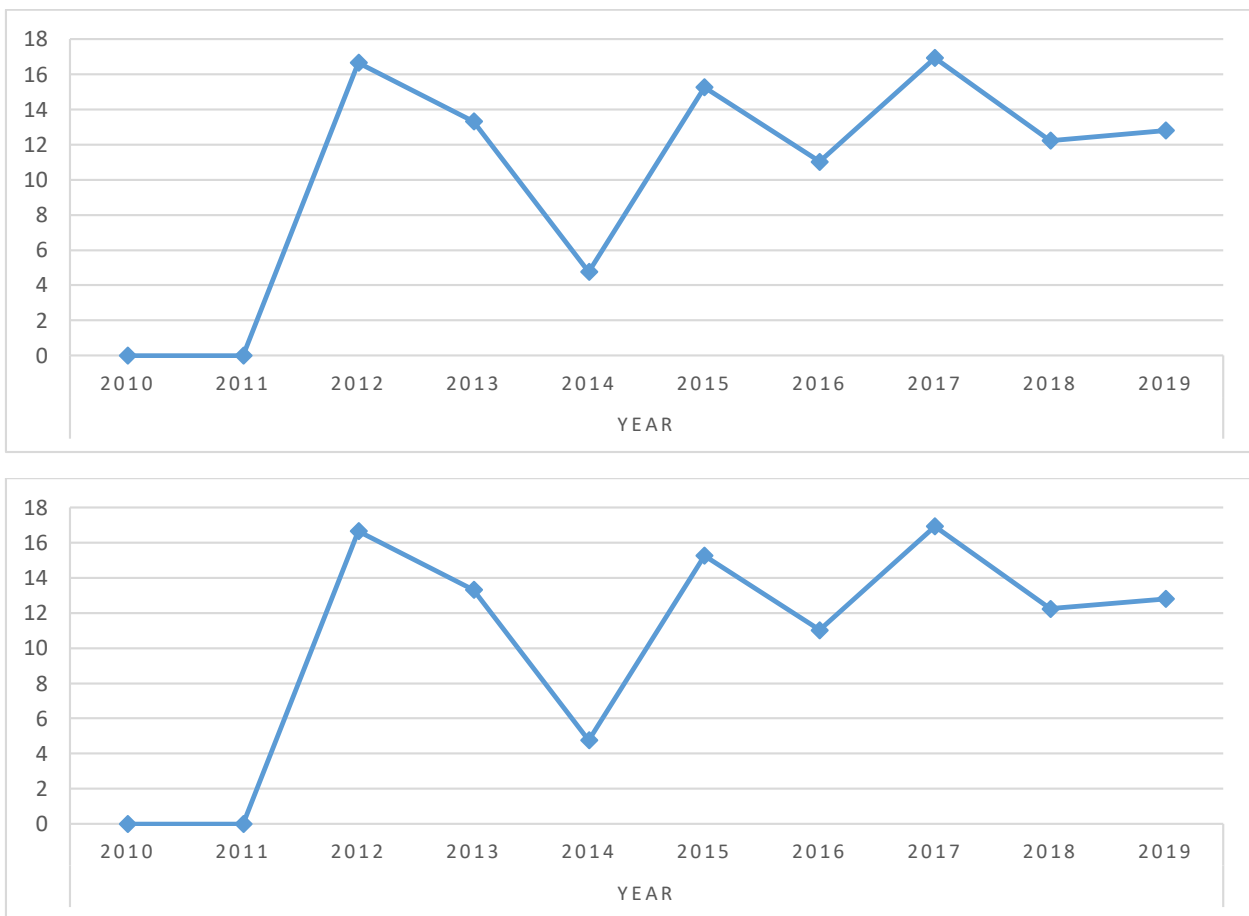


Figure 4. Case fatality rates of CCHF cases between 2010-2019.

4. Discussion

This review summarizes the findings of 14 studies and reports on the occurrence and characteristics of CCHF in Afghanistan from 2010 to 2019 (Table 1). The studies included surveillance, descriptive and analytic epidemiology, molecular epidemiology and virology, and prevalence studies. Overall, these studies indicate that CCHF is present in Afghanistan and that it has been reported

continuously in the country from 2010 to 2019. The total number of reported cases in the surveillance studies ranges from 3426 to 1284, with a confirmed case percentage of ELISA ranging from 2% to 61%. The majority of the studies reported that the majority of cases were male (ranging from 60.3% to 68.5%) and that the age range of cases was between 9 and 85 years. It is important to note that the studies had different sample sizes and years of data collection, which may affect the comparability

of the findings. Additionally, some studies did not provide information on some of the variables, such as occupation, which limits the interpretation of the results.

The results of this study indicated that the majority of reported cases of CCHF in Afghanistan from 2010 to 2019 were male (Table 1). The percentage of male patients ranged from 60.3% to 68.5% across the 14 studies and the reports included in the review. This suggests that there may be certain factors that make men more susceptible to contracting CCHF in Afghanistan or that men may be more likely to seek medical attention and be diagnosed with the disease. Further research is needed to investigate the reasons for this sex disparity and to develop targeted prevention and control strategies for CCHF in the country. These findings are consistent with other CCHF studies conducted in Turkey (26) and Iran (27). Some studies have concluded that the higher occurrence of CCHF in males is due to the more frequent exposure of men to CCHF risk factors, such as farming and animal handling (13, 14).

The results of this study indicate that the majority of reported cases of CCHF in Afghanistan from 2010 to 2019 were reported in the age range of 9–85 years old, with a specific emphasis on the age group of 16–30 years old (Table 1). This is probably because this age group is the working age in Afghanistan, and more people were exposed to CCHF risk factors in these age groups than in the younger or older categories (22). The studies reviewed showed that 45% of reported cases were from this age group, with the lowest number of reported cases being from the age group of 60 years and older at 5%. These findings are consistent with a study conducted by Mohammad Nader Sohak et al. between 2016 and 2018, which also found that the highest number of reported cases were from the age group between 16 and 30 years (25). In Pakistan, the highest statistics belong to the age group over 65 years (5.0%) and the lowest to the age group of 15–24 years (1.6%) (28). In Iran, the findings show that the highest number of respondents relates to the 10–29 year age group (52.4%), and the lowest was for the 1–9 year age group (4.8%) (27). Farmers accounted for the highest number of reported Iranian cases (28.5%).

In Afghanistan, unemployed people (19%) had the highest statistics, while animal sellers (1.7%) had the lowest (25). Therefore, further research is needed to investigate the reasons for this age distribution and to develop targeted prevention and control strategies for CCHF in Afghanistan.

The studies also provided information on the occupations of the participants. The most common occupation among the cases was that of a housewife, followed by health staff, shepherds, butchers, and farmers. Other common occupations included those of students, animal dealers, and laborers. In Iran, butchers and soldiers have the highest and lowest statistics, respectively (27). A study conducted in Turkey found that the high-risk groups for CCHF were men and women working in agriculture and animal husbandry, as well as those working in healthcare settings (29). Additionally, it has been reported that slaughterhouse workers, butchers, and livestock handlers are at high risk of contracting CCHF (30, 31). These findings suggest that individuals who are more likely to come into contact with infected ticks or animals are at greater risk of contracting CCHF.

When comparing the occurrence of CCHF in Afghanistan to other regions, it is important to note that the disease is endemic to many countries in the Middle East, Central Asia, and Africa. The World Health Organization (WHO) estimates that the disease causes an annual incidence of up to 150,000 cases globally, with a case fatality rate of up to 30%. In comparison, Afghanistan has a relatively low case-fatality rate for CCHF (0–16.74%) compared to other countries in the region. For example, Pakistan reported a case-fatality rate of 10–40% in 2018 (32). Additionally, most CCHF cases reported in Afghanistan are in rural areas, where the main sources of infection are believed to be ticks and livestock. This is in contrast to other countries in the region, where the majority of cases are reported in urban areas and the main sources of infection are believed to be mosquitoes and domestic animals.

The province of Herat in Afghanistan shares a border with Iran, which has a high incidence of CCHF. In 2017, 33 cases of CCHF were reported

in Iran, particularly in governorates situated near Herat (33). Additionally, there has been an increase in reported cases of CCHF in the Eastern Mediterranean Region (34). However, it is worth noting that even though more cases have been reported in Pakistan, the provinces bordering Pakistan have had fewer reported cases of CCHF. Studies have also shown that the majority of CCHF cases in Afghanistan, Iran, and Pakistan belong to the same Asia 1 genogroup (35).

5. Recommendations

The findings of this study suggest the need to develop targeted prevention and control strategies for CCHF in Afghanistan. Further research should be conducted to investigate the reasons for gender and age disparities in the occurrence of the disease and to develop targeted prevention and control strategies for these groups. Healthcare workers and individuals in high-risk occupations, such as agriculture, animal husbandry, and slaughterhouses, should be educated about risk factors and the importance of taking preventive measures. Additionally, public awareness campaigns should be conducted to educate the general population regarding the risk factors and symptoms of the disease. The government should also take measures to improve the surveillance system for CCHF and strengthen the capacity of the healthcare system to diagnose and manage cases effectively. Finally, international cooperation and coordination are essential to address the transboundary nature of the disease and prevent its spread to other countries in the region.

6. Limitations

This review had several limitations that should be considered when interpreting the results. Most of the included studies were observational, which may have introduced biases and limitations in the analysis and interpretation of the results. Moreover, the lack of standardized methods for data collection and reporting may have affected the comparability of the results. Additionally, reliance on reported data could have been affected by under- and over-reporting, potentially influencing the overall results and conclusions. Furthermore,

the paucity of studies in certain regions of Afghanistan and the lack of long-term follow-up data on CCHF cases may have limited the generalizability of the findings to the entire country. Therefore, further research, including larger and more comprehensive studies, is needed to obtain a more comprehensive understanding of the occurrence and characteristics of CCHF in Afghanistan.

7. Conclusion

In conclusion, this study is a systematic review of scholarly articles published on CCHF in Afghanistan between 2010 and 2019. This study found that CCHF is a public health concern in Afghanistan, with a significant increase in reported cases in recent years. The main risk factors for transmission include tick bites and contact with infected animals, as well as occupational exposure for those working in the livestock and agricultural sectors. To prevent the spread of CCHF in Afghanistan, effective control measures, such as education on prevention, improved management of infected animals, and proper infection control measures in hospitals and laboratories, need to be implemented. This study provides academic suggestions and approaches for disease prevention by better understanding the factors contributing to the spread of CCHF in Afghanistan to reduce the risk of outbreaks and improve public health in the region.

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Conflict of interest statement

The authors declare that they have no conflicts of interest.

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