CAHIERS MAGELLANES-NS
Volume 08 Issue 1
2026

ISSN:1624-1940
http://magellanes.com/

CRIMEAN–CONGO HAEMORRHAGIC FEVER OUTBREAK IN BAGHDAD AL-KARKH HOSPITALS, IRAQ (2022–2024)

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Abstract:

Background: Crimean–Congo haemorrhagic fever (CCHF) is a severe viral zoonotic disease transmitted primarily through Hyalomma ticks or contact with infected animal tissues or blood. It is endemic in Africa, the Balkans, the Middle East and Asia, including Iraq, and carries a case fatality rate (CFR) ranging from 10–40%.

Aim: To conduct a comprehensive analysis of the epidemiological, sociodemographic, and clinical characteristics of CCHF cases admitted to hospitals in Baghdad Al-Karkh, Iraq, during 2022–2024, and to identify risk factors influencing transmission and outcomes.

Methods: A retrospective descriptive study was conducted among all patients admitted to isolation wards with clinical evidence of CCHF in Baghdad Al-Karkh hospitals from 2022 to 2024. Case definitions followed national and WHO guidelines. Data included demographics, clinical presentation, exposure history, laboratory confirmation, and outcomes.

Results: A total of 217 CCHF cases were admitted during the study period: 51 (23.5%) confirmed, 109 (50.2%) suspected, and 57(26.3%) probable. Eleven deaths were recorded case fatality rate was (CFR 7.8%). The infection fatality rate (IFR) was 5 %, and prevalence was 5 per 100,000 population. Males constituted 59% of cases. Most patients (60%) were from urban areas, and 78% of cases occurred during the summer months—especially May to July. Fever (41%), joint pain (17%), and vomiting (12%) were the most common symptoms, while 19% experienced bleeding manifestations. Most affected patients (42%) were aged 45–65 years.

Conclusion: The 2022–2024 CCHF outbreak in Iraq represents the largest resurgence since 1979. Baghdad Al-Karkh reported significant numbers, though less than southern provinces. Male adults aged

45-65 years were the most affected, largely due to increased exposure to animals, raw meat, and slaughtering activities. Improved awareness and infection control practices in 2024 contributed to better detection and management. Strengthened surveillance and tick-control programs are essential to prevent future outbreaks.

Keywords: **Crimean–Congo haemorrhagic fever, Hyalomma ticks, zoonotic diseases, outbreak, Iraq, case fatality rate .**

Introduction:

Crimean-Congo haemorrhagic fever most frequently occurs among inhabitants of rural areas and agricultural workers. Main causative agent is virus (CCHFV), an RNA virus belonging to the Nairovirus genus. (1) . The disease occurs following the bite of an infected Hyalomma tick, or by direct contact of unprotected hands with ticks, and more rarely through exposure to the blood and tissues of infected livestock, particularly among slaughterhouse workers (2) . It is also considered a potential bioweapon. CCHF outbreaks constitute a threat to public health services as the virus can lead to epidemics, has a high case fatality rate 10–40% , it is endemic in Africa, the Balkans, the Middle East, and in Asia, including Iraq . Human cases of CCHF are mainly treated with general supportive care. The antiviral drug ribavirin, both oral and intravenous formulations, has been used to treat CCHF infection. However, no evidence from randomized clinical trials has demonstrated the effectiveness of ribavirin for treating CCHF. There is currently no vaccine available for either people or animals (3). Risk groups are people working with livestock (e.g., farmers, slaughterhouse workers), healthcare workers, and those in close contact with infected animals or individuals are at higher risk. CCHF occurs most frequently among agricultural workers following the bite of an infected tick, and to a lesser extent among slaughterhouse workers exposed to the blood and tissues of infected livestock and medical personnel through contact with the body fluids of infected patients (2) .CCHF outbreaks often show a seasonal trend, with peaks occurring during warmer months when tick activity is higher. There is an increased risk of further spread of CCHF within Iraq due to the religious holiday (Eid al-Adha) because more camels, cows, and sheep will be slaughtered during that period. Additionally, international cross-border transmission cannot be ruled out, given the increased population movement and possible animal exportation associated with the holiday (3) . In summary, CCHF is a serious viral disease with high mortality rate ,significant implications for human health and public health infrastructure .

Rationale:

CCHF remains a major zoonotic threat in Iraq. The recent upsurge in cases across several governorates, including Baghdad, underscores the need for improved epidemiological understanding. Identifying patterns of transmission, population-level characteristics, and outbreak dynamics is crucial to enhance surveillance, guide resource allocation, and reduce morbidity and mortality.

Objectives :

- **General Objective** To conduct a comprehensive epidemiological assessment of Crimean–Congo haemorrhagic fever cases in Baghdad Al-Karkh between 2022 and 2024.
- **Specific Objectives** To describe the sociodemographic and clinical characteristics of CCHF cases included the following :

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1- To determine exposure patterns and risk factors associated with infection.
2- To analyse the distribution trends by months / time .
3- To calculate case fatality, infection fatality, and suspected fatality rates.
4- To assess outcomes of the CCHF cases.

Methods:

A retrospective descriptive study was conducted among patients admitted to isolation wards in Baghdad Al-Karkh hospitals from January 2022 to December 2024.

First: Case Definitions:

- **Suspected case:** Acute fever (>38°C) with headache, musculoskeletal pain, abdominal pain, vomiting, and exposure to tick bite, animal tissues, or confirmed CCHF cases within 14 days.
- **Probable case:** A suspected case with haemorrhagic manifestations (e.g., petechiae, gum bleeding, gastrointestinal haemorrhage) or thrombocytopenia (<50,000/µL).
- **Confirmed case:** Laboratory confirmation via RT-PCR or ELISA (IgM/IgG).
- **Data Collection** Data were obtained from epidemiological investigation forms and hospital records. Variables included demographics, symptoms, exposure history, occupation, residence, laboratory results, and outcomes. Data were analysed using Microsoft Excel.

Second: Clinical Phases of CCHF: are (5)

- **Incubation:** 3–7 days, depending on transmission route.
- **Pre-haemorrhagic:** 1–7 days, featuring fever, headache, myalgia, gastrointestinal symptoms.
- **Haemorrhagic:** Begins on days 3–5; bleeding manifestations and organ dysfunction occur.
- **Convalescence:** Lasts weeks to up to 1 year.

Table (1): Shows the types of clinical phases , incubation period and description.

Clinical Phase	Typical Duration (incubation period)	Description
Incubation	3–7 days (usually 3–5 days after a tick bite, 5–7 days after exposure to infected blood/tissue)	Asymptomatic period following exposure; duration depends on viral load and route of transmission.
Pre-haemorrhagic Phase	1–7 days	Characterized by sudden onset fever, myalgia, headache, photophobia, gastrointestinal symptoms, and laboratory abnormalities (thrombocytopenia, leukopenia).
Haemorrhagic Phase	Typically begins on days 3–5 of illness	Marked by petechiae, ecchymosis, bleeding from mucosal sites, hematemesis, melena, and possible

Clinical Phase	Typical Duration (incubation period)	Description
		multi-organ dysfunction.
Convalescence	Up to 1 year	Slow recovery with persistent weakness, tachycardia, polyneuritis, hair loss, memory impairment, and emotional instability.

Third : Fatality Rate Definitions:

- **Case Fatality Rate (CFR):** Deaths among confirmed cases.
- **Infection Fatality Rate (IFR):** Deaths among all infected individuals (confirmed ,suspected and probable cases).
  - **Suspected Fatality Rate:** Deaths among suspected cases (15) .

Epidemiology:

Iraq is one of the eastern Mediterranean countries where CCHF is endemic. The CCHF was unrecognized in Iraq before September 1979, when a pregnant woman from Ramadi city was admitted to Al Yarmouk Teaching Hospital in Baghdad capital of Iraq, on 7th September 1979 with haemorrhagic manifestations, and she died 2 days later (6). After the first CCHF outbreak in Iraq, many outbreaks occurred, and the disease became endemic with the re-emergence of outbreaks (7). The southern provinces of Dhi-Qar, Misan, and Basra are among the areas most at risk of CCHF spread. Furthermore, as the modelling showed, certain districts of the capital city of Baghdad were identified as hazardous locations for the growth of vector ticks. Moderately risky regions encompass certain sites across Diyala, Wasit, and Almuthanna in the southern part of Iraq one possible explanation for the high number of cases in southern Iraq, particularly in provinces that border Iran, is the illegal cross-border trade in animals. Controlling the spread of zoonotic diseases, such as CCHF, requires reining in illegal trading activities(31) and small areas in Duhok, Erbil, Kirkuk, and Ninawa in the north. Notably, significant portions of the country, particularly the north, northeast, and western areas of Anbar, were found to have unsuitable habitats for Hyalomma vector ticks in Iraq. Overall, the southern provinces, in comparison to the northeastern provinces, seem more suitable to the hard ticks to complete their life cycles (8) .

The World Health Organization (WHO) estimates that more than three billion people are at risk of developing CCHF, and the annual incidence of CCHF is 10,000-15,000 cases(9), which may be due to multiple causes, such as climate change and an increase in the number and the advancement of viral detection methods. (10). When Soviet troops reoccupied the German-occupied portions of the Crimean Peninsula in mid-1944, the first known epidemic of CCHFV occurred. Acute febrile sickness with a high rate of shock and haemorrhage affected approximately 200 Soviet soldiers (11). In 1956, the disease was isolated from Belgian Congo (now known as the Democratic Republic of the Congo, formerly Zaire). In 1969, researchers discovered that viruses isolated in 1944 and 1956 were identical. By combining the names of the two locations, sickness, and virus, are now known as Crimean-Congo haemorrhagic fever (12).

Results:

During the study period (2022–2024), a total of 217 cases of Crimean–Congo haemorrhagic fever (CCHF) were admitted to hospitals. Of these, 51 cases (23.5%) were confirmed by RT-PCR or ELISA

(IgM/IgG). Additionally, 109 cases (50.2%) were suspected, and 57 cases (26.3%) were classified as probable as in table 2 which revealed that confirmed and suspected cases were highest in 2023 , 30 and 65 respectively .

Table (2): Shows the clinical classification of all CCHF- infected cases according to years.

Clinical Classification	2022	2023	2024	Total
Confirmed	14	30	7	51
Suspected	30	65	14	109
Probable	20	7	30	57
Total	64	102	51	217

The table (3) illustrated that the largest number of deaths occurred among suspected cases (8 deaths), followed by confirmed cases (3 deaths). No deaths were recorded among probable cases. Among the 11 recorded deaths during the study period, 7 (63.6%) were males and 4 (36.4%) were females, indicating that males accounted for the majority of fatal outcomes as shown in table 3 , The case fatality rate (CFR) among all admitted cases was 7.8% (11 deaths). The calculated prevalence during the study period was 5 per 100,000 populations.

Table (3): Shows the number of dead cases according to years and sex during the period of study.

Clinical Classification	2022		2023		2024		M	F	Total Of death	Out come
	M	F	M	F	M	F				
Confirmed	1	1	1	0	0	0	2	1	3	CFR 5.8%
Suspected	3	2	1	1	1	0	5	3	8	CFR 7.3%
Probable	0	0	0	0	0	0	0	0	0	CFR 0
Total	4	3	2	1	1	0	7	4	11	IFR 5%

Notice:

- represented case fatality rate (CFR)
- Represented the infection fatality rate (IFR)

Most cases were reported in 2023, representing 44% of all cases then 35% in 2022 and 21% in 2024 , as illustrated in Figure (1).

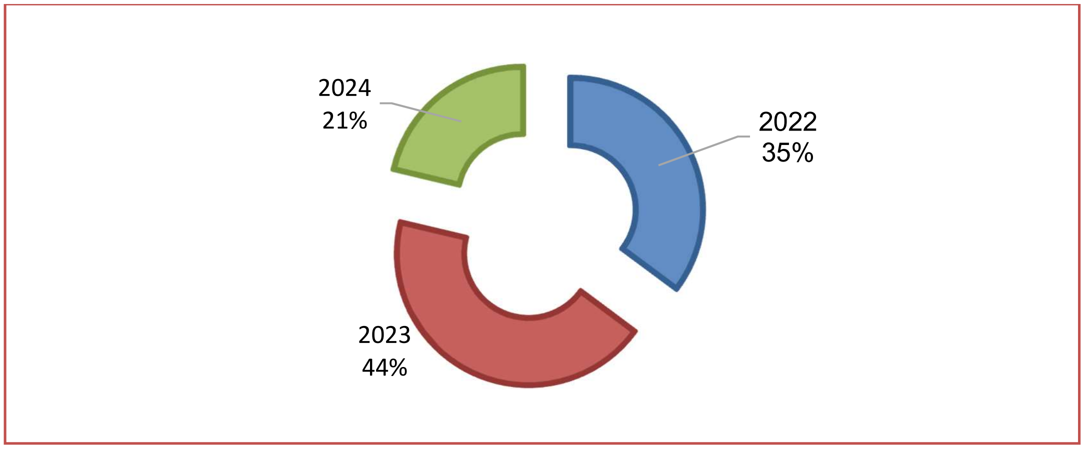

Figure (1): Shows the % infected of all cases according to years .

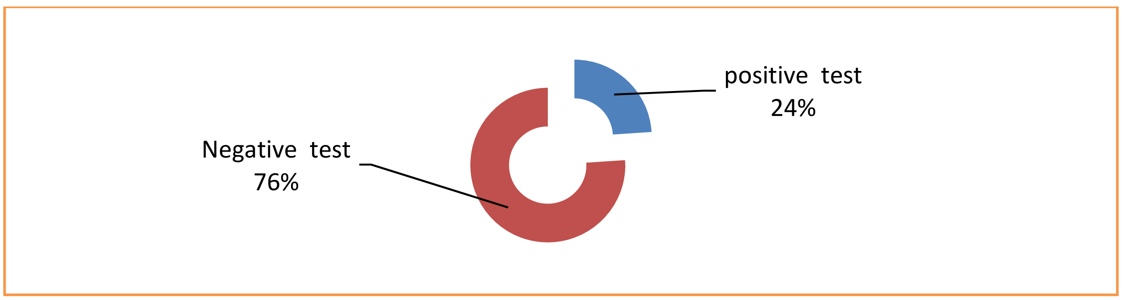

Figure (2): Shows that 24% of the cases had positive results, 76% of cases negative test are either suspected or probable cases.

<u>Demographical characteristics</u>

1- Regarding the sex of CCHF cases , males are more infected than females, 59%, 41% respectively, as in Figure (3).

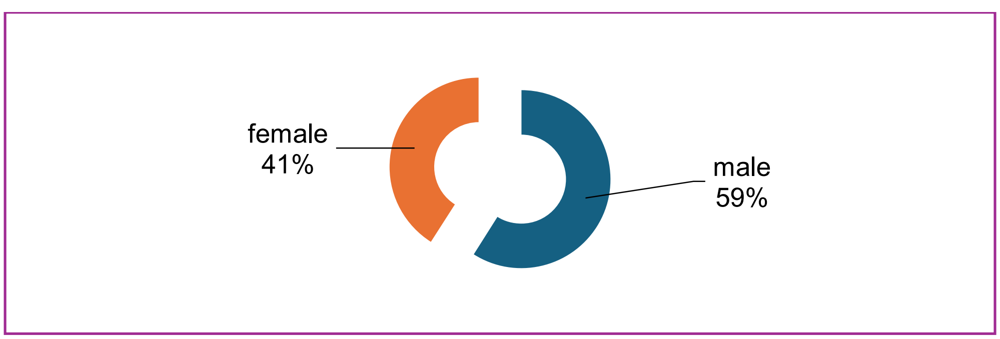

Figure (3): Shows the % distribution of all cases according to sex.

2- Age: Most of the infected cases within the age group 45-65 years were 42 %, and the fewest cases were seen in the age group below 4 years, which was 1%, as shown in Figure (4).

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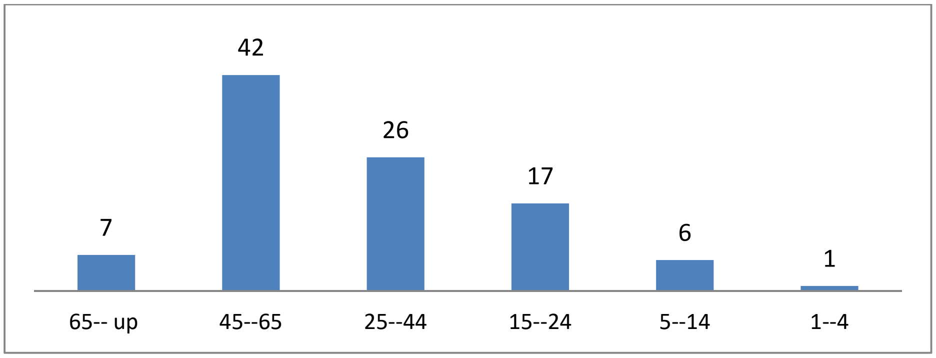


Figure (4): Shows the % distribution of all cases according to age groups.

3- Occupational (risk jobs) illustrated in figure 5 that Most cases were among non-risk occupations (42 %), followed by housewives (34%). Students 12% then ,deal with animal and raw meat , Butchers and medical staff 4% for each as in finger 5 .

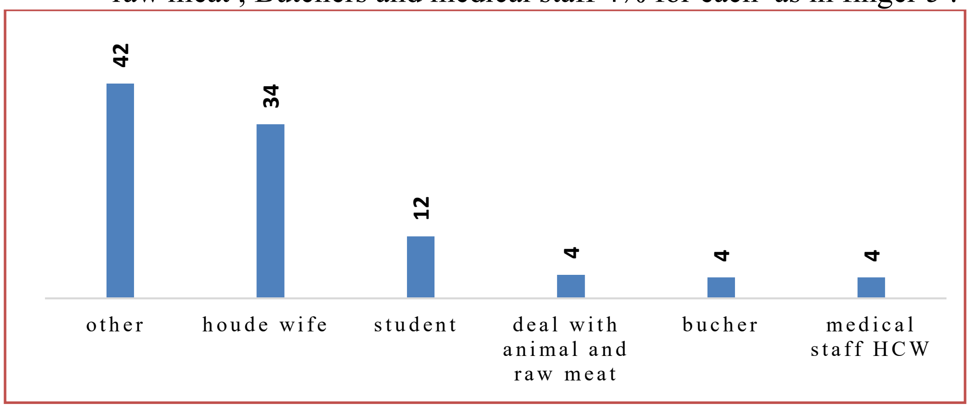
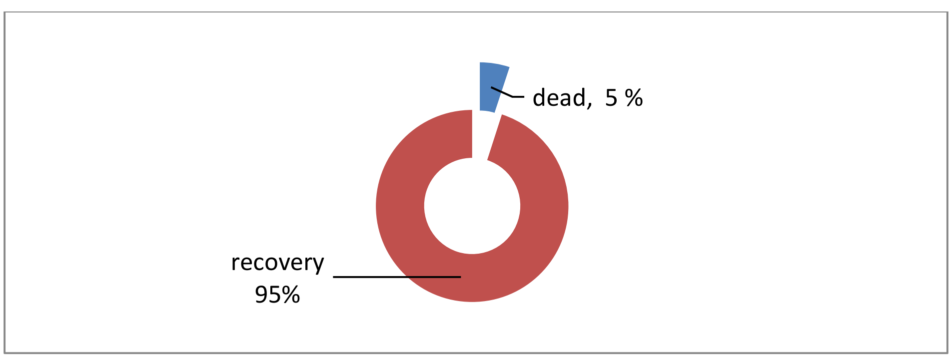


Figure (5) : Shows the % of occupations of all cases .

4- Outcome of the infected cases, Figure 6 revealed that 5% of infected cases were death , a total of 11, 7 of them male and 3 female .



Figure(6) : Shows the % of outcome of all cases.

5- Residence (urban, rural and semi-urban areas) with most of the infected cases in urban 60%, rural areas at 36% and less in semi-urban areas at 4%. as in figure (7).

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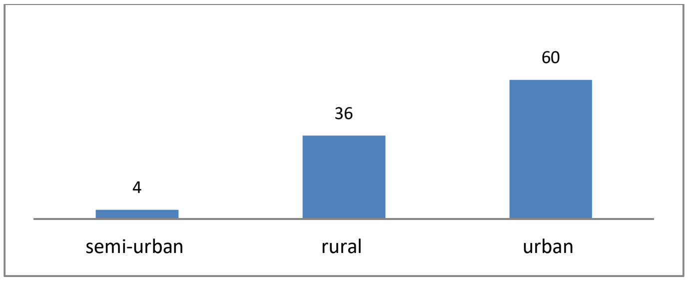

Figure (7): Shows the residency of all CCHF - cases during the period of study.

Epidemiological and exposure history

1 - Regarding the animal contact of infected cases, 14% with animals (cow, sheep, goat) and 86% without a history of animal contact, as in Figure (8).

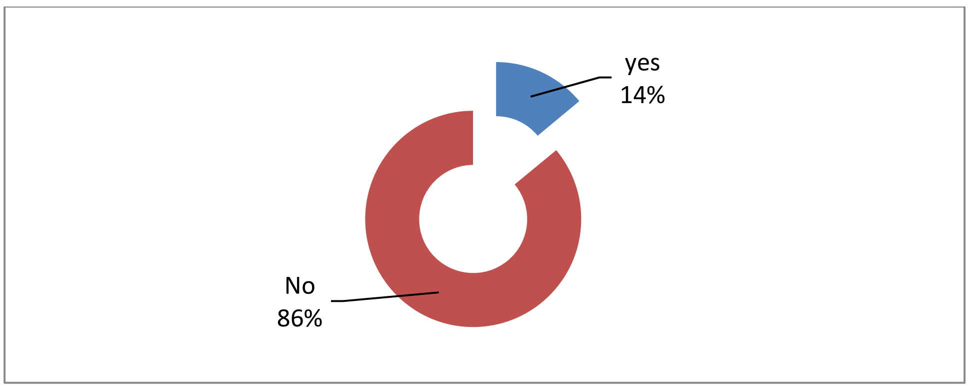

Figure (8): Shows the% of animal contact of all cases during the period of study

. 2- History of contact with confirmed cases: just two cases had a history of contact with a confirmed case during the period of study, and there are 19 cases with a history of contact with raw meat and Only 14% reported direct animal contact as in figure (8).

3-Seasonality / time of year exposure: during summer months in May, June and July 20.7%, 20.7% and .22.6% respectively, as in Figure (9).

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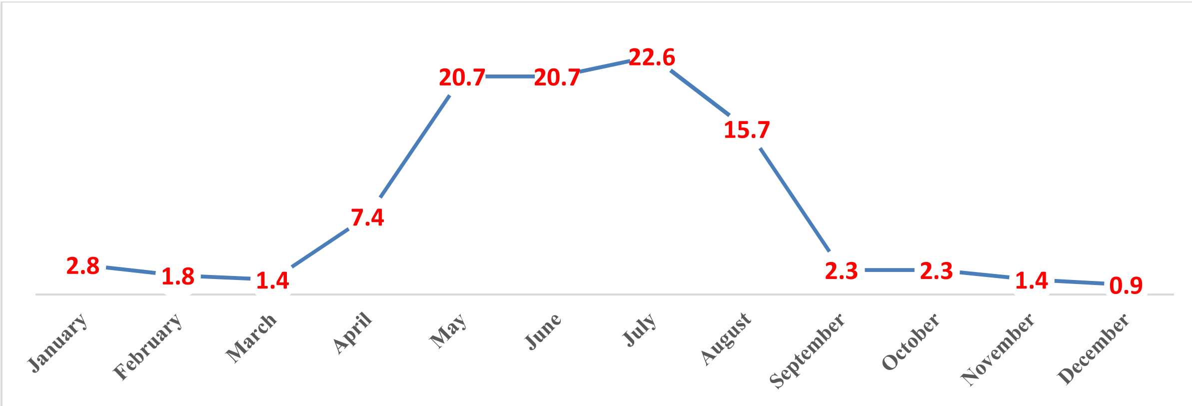
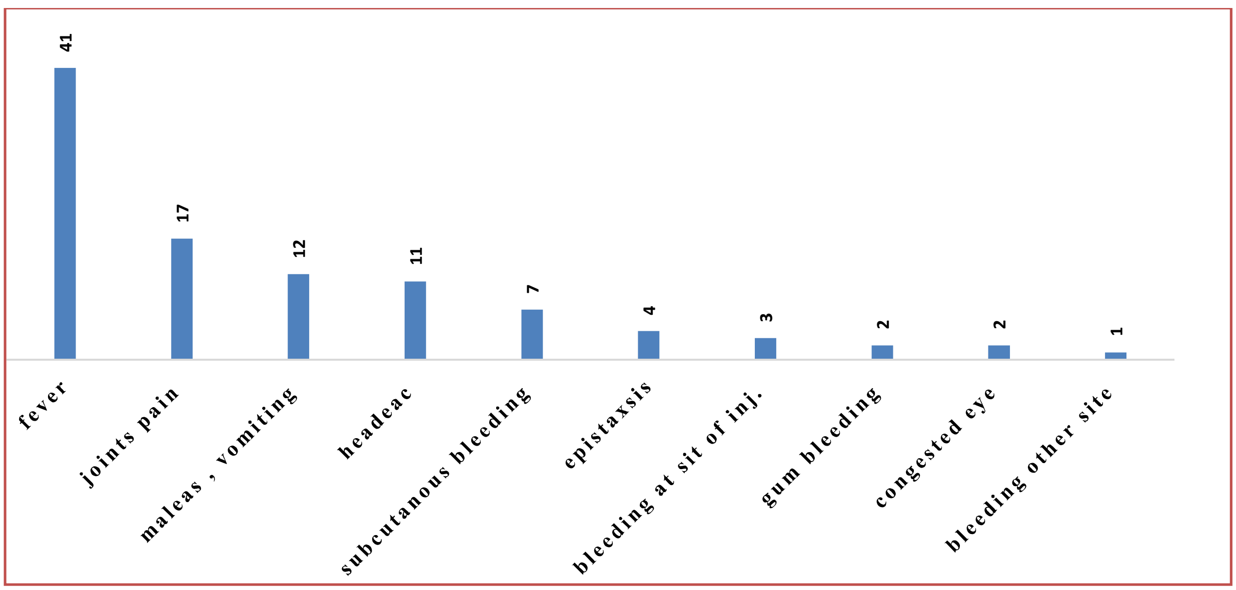


Figure (9): Shows the % of months -wise distribution of all cases of CCHF during the period of study.

4 - Clinical presentation: Figure 10 illustrates that 41% fever, joint pain 17%, malaise and vomiting 12% and about 19% of cases had bleeding manifestations from different sits.



Figure(10) : Shows the % of signs and symptoms of all infected cases with CCHF.

Outcome of Infected Cases:

The clinical outcomes of the reported CCHF cases demonstrated varying fatality rates according to case classification. The case fatality rate (CFR) among confirmed cases was 5.8%, calculated as 3 deaths out of 51 confirmed cases. When considering all reported cases (n = 217), the infection fatality rate (IFR) was 5 %, reflecting 11 deaths among the total infected cases . The fatality rate among suspected cases was 7.3 %, with 8 deaths recorded among 109 suspected cases. (13) . Regarding the clinical course, the length of hospitalisation generally ranged between 5 and 10 days, depending on disease severity and individual patient response.

Discussion :

Crimean–Congo haemorrhagic fever (CCHF) is recognized as the most prevalent tick-borne viral haemorrhagic fever globally and remains a significant public health problem in Iraq. During the study period (2022–2024), the number of reported CCHF cases fluctuated, with 64 cases recorded in 2022, increasing to 102 cases in 2023, and declining to 51 cases in 2024, resulting in a total of 217 hospitalized cases. Based on the clinical case definition, these patients were classified into suspected (n=109), confirmed (n=51), and probable (n=57) cases. These findings are consistent with Study (14), which similarly categorized cases into suspected, confirmed, and probable groups (16, 8, and 5 cases, respectively).

In our study, males constituted a higher proportion of cases (59%) compared to females (41%). This sex distribution aligns with the findings of Study (10), which reported that approximately 58% of cases were male, many of whom resided in rural areas. This pattern is likely attributable to occupational exposure among males who are more frequently engaged in farming, animal husbandry, and outdoor labour—activities associated with high tick-bite risk, as similarly noted in Study (9). Conversely, Study (15) reported a higher proportion of female cases, indicating variability across different settings.

Age distribution analysis showed that the highest proportion of cases occurred in individuals aged 45–65 years (42%), representing the economically active age group. Only 1% of cases occurred among children younger than 4 years. This pattern differs from Study (14), which found that most cases occurred in individuals aged 16–30 years (48%), and the lowest proportion in those older than 50 years (17%). Similarly, a 2023 study in Afghanistan (18) reported that 30% of cases were aged 20–30 years, with no cases in children under 10 years, likely reflecting reduced exposure in younger age groups. Unlike these findings, our study identified 17 cases among individuals younger than 14 years.

Occupational analysis revealed that most affected individuals belonged to "other occupations" not typically considered high-risk (41.5%), followed by housewives (33.6%), students (12%), and butchers, animal handlers, and healthcare workers (4.6%, 4.1%, and 4.1%, respectively). In contrast, Study (19) reported lower proportions of housewives (13.2%) and butchers/animal owners (10.8%), while 57.5% of cases were in other occupations. Study (10) found that one-third of cases were housewives, 21% were butchers or animal handlers, and 23% belonged to other occupations. Housewives remain uniquely vulnerable due to frequent exposure to animal blood during food preparation without adequate protective measures.

In terms of residence, 60% of cases in our study lived in urban areas, 36% in rural areas, and 4% in semi-urban locations. These findings differ from Study (10), which reported that half of all cases resided in rural areas, 40% in urban areas, and the remainder in semi-urban zones.

Only two patients reported direct contact with known confirmed cases, whereas 19 patients had a history of handling raw meat. Study (22) notes that medical personnel and family members may acquire infection through contact with blood or bodily fluids of CCHF patients, particularly during aerosol-generating procedures, highlighting the potential for nosocomial transmission.

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The clinical presentation of cases admitted in our study showed that 41% had fever and 19% exhibited bleeding manifestations. This contrasts with Study (31), which found higher frequencies of fever (69%) and bleeding (59%), and reported headache in 45% of cases. Study (27) documented fever in 90.3% of patients, and Study (20) identified bleeding from injection sites as an important clinical predictor (12.3%). These findings are congruent with Study (28), which also emphasized fever as the primary presenting symptom.

Seasonal trends demonstrated that most infections occurred during the summer months, with peaks in May, June, and July (20.7% and 22.6%). These findings are comparable to Study (14) and Study (23), which reported peak incidence in May and June, while a study in Kabul (24) noted peak activity between July and August. WHO (2022) similarly reported a substantial rise in CCHF cases in Iraq during the first five months of 2022, with approximately 80% reported in April and May. Study (26) also identified increased cases (65%) between June and August, coinciding with Eid al-Adha when widespread animal slaughter elevates exposure risk. Prior studies in Iran, Afghanistan, and Pakistan also suggest that animal contact is more common than tick bites as a transmission route. Climatic factors and large animal populations further contribute to seasonal surges. The pronounced peaks in June and July may additionally be explained by major religious events. During Eid al-Adha, many families purchase and slaughter animals, increasing contact with potentially infected livestock (29). Similarly, during the first 10 days of Moharram, millions of pilgrims visit holy sites in Karbala and Najaf; in 2023 alone, more than five million pilgrims visited Karbala (30), increasing human movement and animal-related activities during this period.

Regarding transmission routes, 14% of cases in our study involved direct contact with animals such as goats, cows, camels, and sheep—animals commonly kept shortly before slaughter during religious occasions. Study (19) reported that 83% of cases had contact with animals or were involved in butchering activities. Tick exposure remains an important but often under-reported transmission route. Study (20) and Study (21) emphasize that Hyalomma ticks are a major vector of CCHFV. The low proportion of reported tick bites may be due to the painless nature of Hyalomma bites (31). Nosocomial transmission, documented in Study (2), has also been repeatedly reported in Iraq, including outbreaks in 1979, 1992, and 1996, highlighting the ongoing risk to healthcare workers

clinical outcomes, 11 out of 217 case admitted to isolation wards were died (7 males and 4 females), of whom 3 were confirmed cases, the case fatality rate (CFR) was 5.8%. This is less than the CFR reported in Study (16) was 7.7% . However, fatality rates can vary widely; for example, Study (17) reported a CFR as high as 80%, likely influenced by factors such as virus strain differences, population health status, and the availability and timing of supportive care. In the present study, the CFR among suspected cases was 7.3%. Another study (17) reported a CFR was 15%, regarding the sex males comprising the majority of deaths (83.3%), while the study of (32) revealed that zero CFR was reported in Al-Salama Hospital in Almeria Baghdad city among admitted 29 cases.

Finally, several studies have indicated that Crimean-Congo haemorrhagic fever (CCHF) occurs more frequently in Dhi Qar and other southern provinces of Iraq due to a combination of ecological, occupational, and socio-economic factors that Favor the transmission of the virus and its primary vector, Hyalomma ticks. Firstly, the high density of livestock and frequent human–animal contact in these regions significantly increase the risk of viral exposure . Secondly, the hot and arid climate of southern Iraq provides favourable conditions for the survival and proliferation of Hyalomma ticks . Thirdly, traditional slaughtering practices, particularly during religious and cultural events, further facilitate human exposure to infected animal blood and tissues . Fourthly, individuals engaged in high-risk occupations, such as farming, herding, and slaughterhouse work, are more likely to come into contact with the vector or infected animals . Fifthly, limited tick-control programs and inadequate veterinary services in these areas contribute to the persistence and spread of tick populations . Finally, the migration of livestock within southern provinces, along with cross-border animal movement from neighbouring Iran and Gulf countries, plays a role in introducing and sustaining CCHF in these regions . Collectively, these factors create an environment conducive to ongoing CCHF transmission and contribute to the higher prevalence observed in southern Iraq (33,34,35,36,37and 38).

Conclusion :

The CCHF outbreak in Iraq from 2022 to 2024 represents the largest reported incidence since 1979, with a notably high number of confirmed cases nationwide, including Baghdad Al-Karkh. In Baghdad Al-Karkh specifically, cases occurred less frequently compared to southern provinces such as Dhi Qar, likely reflecting improvements in clinical awareness, case management, and surveillance. The majority of cases were observed among males aged 45–65 years, with a significant proportion linked to direct contact with animals, handling of raw meat, and participation in animal slaughtering—activities recognized as major risk factors for infection. By 2024, healthcare providers in Baghdad Al-Karkh demonstrated increased knowledge, positive attitudes, and heightened perception regarding CCHF, which likely contributed to enhanced diagnostic and control measures. Furthermore, the outbreak coincided with a temporary lapse in veterinary and tick-control programs during the COVID-19 pandemic, resulting in increased tick infestations and a subsequent surge in CCHF cases. Collectively, these findings underscore the importance of coordinated public health interventions, sustained veterinary surveillance, and community education to mitigate the impact of future CCHF outbreaks in Iraq.

References:

1. Frank MG, Weaver G, Raabe V. Crimean Congo Haemorrhagic Fever Virus for Clinicians—Virology, Pathogenesis, and Pathology. Emerg Infect Dis. 2024;30(5).
2. Bente DA, Forester NL, Watts DM, McAuley AJ, Whitehouse CA, Bray M. Crimean-Congo haemorrhagic fever: history, epidemiology, pathogenesis, clinical syndrome and genetic diversity. Antiviral Res. 2013;100:159–89.
3. World Health Organization. Disease Outbreak News: Crimean-Congo Haemorrhagic Fever in Iraq. 1 June 2022. Available from: https://www.who.int/emergencies/disease-outbreak-news/item/2022-DON386
4. Iraqi Ministry of Health. National Action Plan for Health Security (2019–2023). Baghdad: Iraqi Ministry of Health; 2019. Available from: https://moh.gov.iq/upload/998.pdf
5. Frank MG, Weaver G, Raabe V. Crimean Congo Haemorrhagic Fever Virus for Clinicians—Virology, Pathogenesis, and Pathology. Emerg Infect Dis. 2024;30(5).
6. Al-Saqur IM, Althwani AN, Safah HN, Aubiad NH, Sabar RA, Hadi DD, Haitham SH. Incidence of Crimean-Congo Haemorrhagic Fever in Different Governorates of Iraq. Al-Esraa Univ Coll J Med Sci. 2024;5(7):11–7.
7. Al-Salihi KA, Mahmoud Z, Younise MH, Hussain T. Review on Crimean-Congo haemorrhagic fever with special focus on Iraqi outbreaks. Mirror Res Vet Sci Anim. 2023;12:1–44.

8. Abdulrahman MA. Crimean-Congo haemorrhagic fever: a real health problem in Iraq. IJID Reg. 2025;14:100588.
9. World Health Organization. Introduction to Crimean-Congo haemorrhagic fever. 2024. Available from: https://cdn.who.int/media/docs/default-source/documents/health-topics/crimean-congo-haemorrhaigc-fever/introduction-to-crimean-congo-haemorrhagic-fever.pdf
10. Belobo JTE, Kenmoe S, Kengne-Nde C, Emoh CPD, Bowo-Ngandji A, Tchatchouang S, et al. Worldwide epidemiology of Crimean-Congo haemorrhagic fever virus in humans, ticks, and other animal species: a systematic review and meta-analysis. PLoS Negl Trop Dis. 2021;15:e0009387.
11. Frank MG, Weaver G, Raabe V. Crimean-Congo haemorrhagic fever virus for clinicians—epidemiology, clinical manifestations, and prevention. Emerg Infect Dis. 2024;30:854–63.
12. Casals J. Antigenic similarity between the virus causing Crimean haemorrhagic fever and Congo virus. Proc Soc Exp Biol Med. 1969;131:233–6.
13. Association of Health Journalism. Available from: https://healthjournalism.org/
14. Fawzi H, Yahya F, Hasan IF, Salman MT, Mahmood AB. Epidemiological, clinical presentation, laboratory findings and outcome of Congo haemorrhagic fever cases admitted to Al-Salama Hospital in Al-America, Baghdad. Pharma Innov J. 2023;12(3):4565–71.
15. Duran R. Evaluation of patients with Crimean-Congo hemorrhagic fever in Bolu, Turkey. Afr Health Sci. 2013;13(2):233–42.
16. Al-Khafaji SH, Panahi MH, Baghdadi G, et al. Epidemiologic features and risk factors for Crimean-Congo hemorrhagic fever in Dhi Qar Province, Iraq. Cureus. 2024;16(5):e61445.
17. Noreen N, Naveed SD, Rana I, Asghar J, Faiz A, Mohiuddin N. Characterization of suspected Crimean-Congo haemorrhagic fever cases in a public sector hospital, Islamabad. Glob Secur Health Sci Policy. 2020;5(1).
18. Sahak MN, Arifi F, Saeedzai SA. Descriptive epidemiology of Crimean-Congo hemorrhagic fever in Afghanistan: reported cases to national surveillance, 2016–2018. Int J Infect Dis. 2019;88:135–40.
19. Alhilfi RA, Khaleel HA, Raheem BM, Mahdi SG, Tabche C, Rawaf S. Large outbreak of Crimean-Congo haemorrhagic fever in Iraq, 2022. IJID Reg. 2023;6:76–9.
20. Seif S, et al. Clinical and molecular epidemiology of Crimean-Congo haemorrhagic fever in Oman. PLoS Negl Trop Dis. 2019;13:e0007100.
21. El-Azazy O. Crimean-Congo haemorrhagic fever virus infection in the Western Province of Saudi Arabia. Trans R Soc Trop Med Hyg. 1997;91(3):275–8.
22. Hatami H, Qaderi S, Omid AM. Criteria for clinical diagnosis of Crimean-Congo haemorrhagic fever in northern Iran. Caspian J Intern Med. 2013;4(1):617–20.
23. Pshenichnaya NY, Nenadskaya SA. Probable nosocomial transmission after aerosol-generating medical procedures in Russia. Int J Infect Dis. 2015;33:120–2.
24. Abdullah S, et al. Crimean-Congo haemorrhagic fever management in Erbil during 2010–2011. Eur Sci J. 2014;10:24.
25. Hossein H. Investigation of Crimean-Congo haemorrhagic fever in patients admitted in Antani Hospital, Kabul, 2017–2019. Int J Prev Med. 2019.
26. Tsergouli K, et al. Nosocomial infections caused by Crimean-Congo haemorrhagic fever virus. J Hosp Infect. 2020;105(1):43–52.
27. Yilmaz GR, Buzgan T, Irmak H, Safran A, Uzun R, Cevik MA, Torunoglu MA. Epidemiology of Crimean-Congo haemorrhagic fever in Turkey, 2002–2007. Int J Infect Dis. 2009;13:380–6.

28. Mustafa AH, Lami F, Khaleel HA. Epidemiology of Crimean-Congo haemorrhagic fever in Iraq. medRxiv. 2023. doi:10.1101/2023.11.22.23298722.
29. Al-Abri SS, Al Abaidani IA, Fazlalipour M, Mostafavi E, Leblebicioglu H, Pshenichnaya N. Current status of Crimean-Congo haemorrhagic fever in the WHO Eastern Mediterranean Region. Int J Infect Dis. 2017;58:82–9.
30. Baghdad Today News. Karbala Governor: more than 5 million visitors commemorated the Ashura pilgrimage. 2024. Available from: https://baghdadtoday.news/227595-.html
31. Ismael SS, Mustafa SI, Abdullah B. Relation between COVID-19 pandemic and the outbreak of Crimean-Congo haemorrhagic fever in Iraq, 2023. J Contemp Med Sci. 2025;10:98–101.
32. Atshan FH, Fawzi Y, Hasan IF, Salman MT, Mahmood AB. Epidemiological, clinical presentation, laboratory findings and outcome of Congo hemorrhagic fever cases admitted to Al-Salama Hospital in alameria Baghdad city: retrospective study-2022. Pharma Innovation. 2023;12(3):4565-4571.
33. Al-Abdely HM, Al-Baker M, Kamil L, Al-Jaffaly A. Epidemiological characteristics of Crimean-Congo hemorrhagic fever in Iraq. East Mediterr Health J. 2023;29(4):300-308

34- Rakhshani A, Mohammadi A, Sedaghat MM. Climate impacts on the distribution of Hyalomma ticks in the Middle East. Acta Trop. 2020;205:105414.

35- Yagci-Caglayik D, Deniz A, Koc Z, et al. Risk factors for CCHF among slaughterhouse workers. Vector Borne Zoonotic Dis. 2014;14(9):608-614

36= Mostafavi E, Haghdoost AA. Occupational risk factors for CCHF: a meta-analysis. Zoonoses Public Health. 2017;64(9):e42-e50.

37- Al-Salihi K, Al-Chalabi M. Crimean-Congo hemorrhagic fever in Iraq: current situation and future directions. Iraqi J Med Sci. 2022;20(3):345-353.

38- Malaeb BS, Salloum T, Madi NM. CCHF outbreaks in the Eastern Mediterranean: risk determinants. One Health. 2022;14:100394.