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RESEARCH ARTICLE

Incidence of Crimean-Congo Hemorrhagic Fever (CCHF) in Different Governorates of Iraq

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ABSTRACT

Crimean-Congo hemorrhagic Fever (CCHF) is one of the most important infectious diseases in the world. This disease is considered as a dangerous zoonotic viral disease transmitted from animals to human by *Hyalomma* ticks. The first case was registered in Iraq in 1979, which led to the death of the patient, her doctor and some of the medical staff in Baghdad/Al-Yarmouq hospital. The current study was conducting on the data of (399) patients suffering from symptoms of hemorrhagic septicemia for two years (2021 and 2022) which received from Central Disease Control (CDC) in Baghdad depending on serological test. The results revealed that the number of patients who were registered in (2022) was higher than in (2021), the most affected governorates were Thi Qar, Waist and Nineveh in particular at June and May. It was found that, the disease affect both sexes in different ages, and the most affected age group (25–44) year followed by (19–24) also the highest infections were in males (232) compared to females (148). The fever and bleeding from natural opening were the prominent symptoms appeared on patients. The result confirmed that, the categories at high risk of infection were householders, individuals who had contact with the animals as butchers and breeders. Finally the important preventive measures for this dangerous disease should be taken to prevent infection or reduce its spread which include, early diagnosis the disease in human, public medical health education, and using insecticide for tick control.

Keywords: CCHF, Zoonotic disease, Nirovirus, Hyalomma ticks, Butchers and House holder

1. Introduction

Crimean-Congo hemorrhagic fever (CCHF) is an important tick-borne viral infection with a fatality rate of up to 50% during outbreaks caused by Nirovirus belongs to the family

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Bunyaviridae [5]. This disease is considered as dangerous zoonotic disease transmitted from different field animals to human by ticks, *Hyalomma spp* ticks are the major source of human infection (Tylor, 1967). Crimean-Congo hemorrhagic fever virus (CCHFV) is sustained in the ecosystem in benign form through vertical and horizontal transmission cycles involving tick vectors, wildlife and livestock as reported by Ibrahim et al. [8]. The CCHF occurs most often among butchers, slaughterhouse workers, and farmworkers through infected tick bites or/and contact with blood and tissues of infected livestock. The nosocomial transmission can occur in auxiliary nurses and physicians through contact with the infected patients [12]. The widespread distribution of CCHFV most probably occurred by ticks on migratory birds, or through international travel and trade of livestock and wildlife (Tylor, 1967).

In 1979, a 24 year-old lady was diagnosed with CCHF at Al-Yarmouk hospital, Baghdad, making her the first confirmed case of CCHF in the country, later two close contacts, one physician and one health worker also contracted the infection and subsequently died [13], Tikrete et al., 1981. Thereafter, CCHF cases were reported in Iraq in different periods from 1980 to 2014 (Alsalehi et al., 2022) and most of the cases had a history of contact with animals and others were physicians/health workers. Tantawi et al. [14] carried out a study to determine the prevalence of CCHFV in animals and most of the animals tested positive with high prevalence for antibodies to the virus.

A review in the Arab world by Perveen and Khan (2022) included epidemiology, transmission, distribution, mortality, and clinical features of CCHF in 22 Arab countries, comprising the Arab world were conducted. Based on the analysis of 57 studies published from 1978 to 2021, found 20 tick species that could be associated with CCHFV transmission. During the 43-year period, 321 cases of CCHF were reported from 9/22 Arab countries, Iraq, Kuwait, UAE, Saudi Arabia, Oman, Sudan, Egypt, Tunisia, and Mauritania. The mean case fatality rate was 29% during various outbreaks. Individuals working in abattoirs/slaughter houses, livestock farms, and healthcare were most at risk. Contact with blood or body secretions from infected animals and patients was the most common. Also CCHFV serological evidence has been recorded from 11 Arab countries including Iraq, Kuwait, UAE, Saudi Arabia, Oman, Sudan, Egypt, Tunisia, Algeria, Mauritania, and Morocco. However, deaths were reported in only seven counties, Mauritania, Oman, UAE, Saudi Arabia, Egypt, Iraq, and Sudan. Fatality rate ranged from 24 to 61% (mean: 29%) during the different outbreaks.

The aim of current research is highlighted the incidence of CCHF in Iraqi governorates through last few years.

2. Materials and methods

The study depend on the data received from CDC - Ministry of Health during the period extended from the beginning of 2021 till the end of 2022, concerning the infection in all Iraqi governorates, in which the hemorrhagic fever prevail, taking into consideration, monthly spread in the governorates, Age, sex (male and female), professional, risk factors, symptoms, morbidity and mortality as mentioned in CDC protocol, depending on examination of serum samples of patients using Enzyme linked Immunosorbent Assay (ELISA)

3. Results

The infected individuals in 2021 were much lower (19) than that in 2022(380) and appeared in 4 governorates, most affected governorate was Thi Qar have been showed

Table 1. Distribution of CCFH cases according to governorates and months in 2021.

Speared of infection according to governorates and months in 2021													
Governorate	Jan	Feb	March	April	May	Jun	July	Aug	Sep	Oct	Nov	Dec	Total
Thi Qar	0	0	0	0	0	0	2	0	5	2	4	2	15
Nineveh	0	0	0	0	0	0	0	0	2	0	0	0	2
Diyala	0	0	0	0	0	1	0	0	0	0	0	0	1
Al-Muthna	0	0	0	0	0	0	0	0	0	0	1	0	1
Total	0	0	0	0	0	1	2	0	7	2	5	2	19

Table 2. Distribution of patients according to age groups.

Age group by years						
1–4	5–14	15–24	25–44	45–64	<65	Total
0	0	9	8	2	0	19

Table 3. Infection in females and males.

Sex		
Females	Males	Total
10	9	19

Table 4. Infection of individuals according to profession.

Profession						
Butchers	Butchers' shop workers	Governorate employee	Livestock breeders	House holder	Students	Total
2	3	2	1	8	3	19

15 case, and most of them (7) occurred in September and (5) in November as shown in Table 1.

Most cases recorded in the age group (15–24 year) followed by (25–44) with 9 and 8 respectively, in same time the infection appeared in females (10) was slightly more than males (9) as shown in (Tables 2 and 3).

Regarding to a profession, the most affected criteria were house holder followed individuals work in butchers' shop (Table 4).

The most important symptoms appeared on patients were fever (19), bleeding from injection by syringe (7) and bleeding from the skin (6). It was observed that, the number of recovered patients 10(52.6%) was slightly more than death 9 (47.4%) as demonstrated in (Tables 5 and 6).

The total of infected patents in the year 2022 was (380) cases. Mostly appeared in Thi Qar Governorate (164) discovered mainly in May and June reached to 36 and 39 respectively, followed by patients residence in Mesan governorate with 33 cases, appeared mostly in

Table 5. Distribution of patients according to symptoms.

Symptom					
Bleeding from ear	Bleeding under skin	Bleeding from mouth	Bleeding from nose	Bleeding from injection by syringe	Fever
5	6	3	5	7	19

Table 6. Final assessment of infection.

Final situation	
Death	Recover	Total
9	10	19

Table 7. Distribution of CCFH cases according to governorates and months in 2022.

Governorate	Jan	Feb.	Mar	April	May	Jun	July	Aug	Sep	Oct	Nov	Dec	Total
ThiQar	0	0	1	16	36	39	27	17	10	6	9	3	164
Mesan	0	0	0	0	18	9	4	1	4	0	0	1	37
Waist	0	0	0	0	13	10	0	0	1	0	1	0	25
Babylon	0	0	0	3	10	5	6	0	0	0	0	0	24
Muthna	0	0	0	2	7	4	5	1	0	0	1	0	20
Basra	0	0	0	0	3	3	5	2	1	0	1	4	19
Diywanai	0	0	0	3	3	4	0	2	0	4	2	0	18
Kerbela	0	0	0	1	3	4	0	1	1	0	4	3	17
Bag.Karch	0	0	0	0	5	4	1	0	0	1	2	1	14
Bagd-Rusafa	0	0	0	1	1	3	2	2	0	1	3	0	13
Ninawa	0	0	0	0	2	2	0	2	1	2	0	0	9
Diyala	0	0	0	0	1	1	1	1	0	0	0	0	4
Nagif	0	0	0	0	1	1	1	0	1	0	0	0	4
Erbil	0	0	0	0	1	2	0	0	0	0	1	0	4
Kirkuk	0	0	0	0	1	1	1	0	0	0	0	0	4
Dehouk	0	0	0	0	1	1	0	1	0	0	0	0	3
Anbar	0	0	0	0	1	0	0	0	0	0	0	0	1

Table 8. Disruption of patients according to age groups of in 2022.

Age groups by years						
1–4	5–14	15–24	25–44	45–64	<65	Total
2	15	99	146	95	23	380

Table 9. Number of infected females and males in 2022.

Sex		
Female	Male	Total
148	232	380

May and June (18 and 9) the lowest detected patients was in Anbar with one case only (Table 7).

The highest infection rate was (38.4%) of 164 case appeared in age group (25–44 year), followed by (26%) of 99 case in age group (15–24 year) whereas the lowest rate (0.5%) was detected in the group (1–4 year) with2 cases (Table 8). The males were more affected 232 (61.05%) than females 148 (39%) as described in Table 9.

According to profession it was found that, the most affected criteria were in house holder (123 case), followed by butchers (62 case) and worker in butchers' shop (61) the lowest was in the children (7 cases) Table 10.

The prominent symptoms noticed on patients was fever (359 patients), followed by bleeding due to injection by syringe (109 patients) and bleeding under skin (104 Patients), whereas only 34 patients was suffered from nose bleeding (Table 11)

Table 10. Distribution of infection among different profession in 2022.

Profession								
Butchers	Butchers' shop workers	Livestock breeders	Governorate employee	House holder	Student	Retired	Children	Total
62	61	35	37	123	32	23	7	380

Table 11. Prominent symptoms of infected patients in 2022.

Symptoms					
Bleeding under skin	Bleeding from ear	Bleeding from the mouth	Bleeding from the nose	Bleeding from injection by syringe	Fever
104	72	77	34	109	359

Table 12. The Final assessment of the infection in 2022.

Final situation		
Death	Recovery	Total
74	306	380

The final assessment of the infection in 2022, revealed recovery of 62.8% (306 case) and death of 37.2% (74 case) as shown in Table 12.

4. Discussion

This disease firstly appeared in Russia and Democratic Republic Congo, and then transmitted to other parts of the world and become endemic in Africa, Asia, Eastern Europe, and the Middle East [6, 17], Mirembe et al., 2021. A study by Tantawi et al. [13] and Al-Tikriti et al. [4] revealed that CCHF has been reported in Iraq as early as 1979 when the disease was initially diagnosed in ten patients. After those six cases were reported between 1989 and 2009; 11 cases 2010; three fatal cases were reported in 2018 [17].

The current study shed light on the spreading of CCHF infection in Iraq especially in the 2021 and 2022. It is clearly observed the incidence of disease was very high in 2022 in comparison with 2021. The outcome revealed that not all Iraqi governorates were affected with CCHF whether in 2021(4/18 governorates) or 2022 (16/18). It was found that, the disease in south governorates more prevailed than that of north and the highest number of cases were diagnosed in Thi Qar which considered the most infected governorate, include 15/19 (78.9%) of cases in 2021 and 164/380 (43.1%) of cases in 2022. Previously Al-Sulhi et al. [1–3] pointed to the presence of CCHF in middle and south of Iraq more than the north. and the high spread also, noticed in Iran by found high [7] infection in south and middle, were higher than,the north, nearly,same observation,noticed in some of Arab countries [18].

Since 2021, Iraq has reported a notable increase in cases and, in 2022, WHO issued an outbreak alert based on the country reporting 212 cases and 27 deaths in the first 5 months of the year, much higher than that reported in 2021 (WHO, 2022).

It was noticed that, the disease affect both sexes in different ages with high incidence reached to 380 infected patients in 2022 which is about 20 times more than that in 2021 the ongoing spike in cases has been attributed to many reasons, the low slaughter house

standardization with trade of contaminated meat in Iraq, the increased density of ticks and beside the decrease the campaign for eradication of insect mainly tick, this was hardening by the struck of Covid-19 which halt all the activities of ticks eradication, in the beginning of twenties.

The most affected age groups were, 15–24 year and 25–44 and low infection in low age and elderly people, this could be belong to the activity of these groups which may increase its contact with animal and vectors. The incidence in males and females were nearly the same; it appeared that, they are subjected to the similar factors. These had been reported also by Sabra (2012) and Al-Salihi [3]. According to profession, the most affected was the house holder in both years, this was unexpected, as they are mostly indoor, but it seemed they are dealing with fresh meat without taking preventive measure followed by the butchers' shop workers and Butures who were directly in contact with different types of animals and fresh meat.

The hemorrhage in skin and normal orifices (mouth, nose and ear) was observed as a prominent symptom in nearly all of patients which is consistently related to this disease. Sağmak et al. [11] also pointed to the same symptom on the infected patients in their study. The high fever and hemorrhage together consider a distinguish symptoms of this disease and good indicator for early diagnosis which is critical for patient survival and for preventing the spread of infection through well-documented human-to-human transmission. The most important issue should brought to the attention that, these symptoms and the high fatale cases occur for the people who are in direct contact with infected animals, and tick bites in addition to health worker by nosocomial infection which is the most dangerous factor. Many researchers reported these symptoms as Al-Shaliet et al. (2022) and Sah et al. (2022) who found, the health workers were the most affected with high fever, Beside they observed the mortality reached 30% which was higher than that in this study in 2022, which reached 27%, but lower than that in 2021, which recorded 47%. The high mortality in infected patients gave alarm to the seriousness of this disease and should be implementing various preventive measurement specially that related with control of *Hylomma spp* ticks the vector of the virus causing disease and reducing its population, and collaborating with veterinary staff to ensure the health of animals and standardizing slaughterhouse practices.

In Iraq the infection was increase with the alliance with social activities particulaly in Eid Al-adha, were large number of animals slaughter, especially in street without taking any health measure, in which the contaminated blood spread easily through the environment, this matter also mentioned in the study of Sisman (2013) and Ibrahim et al. [8].

Many reasons behind the spread of this dangerous zoonotic disease in Iraq through last years related, to increase population of the vector specially *Hylomma spp* ticks due to favorable climate and environment for its presence in addition to lack using the insecticides in the proper time from one side, beside the free animal trade and poor public health education that plays a critical role on other side. This fatal disease requires immediate attention for its timely prevention and control to limit its further expansion and that doesn't achieved without cooperation of the Ministry of Agriculture and Ministry of Higher Education and Scientific Research.

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