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Distribution of Crimean-Congo Hemorrhagic Fever Virus (CCHF) Infections Among Animals and Human in Diyala Province

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ABSTRACT

In this study, 30 blood samples were collected from Human patients infected with CCHF virus residing in Alrazi Hospital, 30 samples from cattles and 30 from goats from the veterinary medical clinic in Baquba city. Also, 15 blood samples were taken from healthy individuals, 15 samples from healthy cattles and 15 samples from healthy goats as control groups. The study was carried out during the period from, 15th January to 30th June 2023 in Diyala Province. According to the results, the (Mean±S.E) of Human anti IgM antibodies was 2.40±0.26 in patients with CCHF and 2.13±0.23 in cattles with non-significant differences, while the (Mean±S.E) of anti IgM antibodies was 1.72±0.15 in goats with a significant difference between goats and humans (p=0.03). The (Mean±S.E) of Human anti IgG antibodies was 1.42±0.11 in patients with CCHF and 1.27±0.12 in cattles with non-significant differences. Also, the mean ±S.E of anti IgG was 1.24±0.11 in goats with non-significant differences between the animals and Humans. The mean ±S.E of anti-IgM Human antibodies was 2.40±0.26 compared to the control group 0.08±0.05 with a highly significant difference p<0.001. The mean of anti-IgG human antibodies was 1.42±0.11 compared to the control group 0.13±0.06 with a highly significant difference p<0.001. The mean of anti-IgM cattle antibodies was 2.13±0.23 compared to the control group 0.08±0.04, with a highly significant difference p<0.001. The mean of anti-IgG antibodies was 1.27±0.12 compared to the control group 0.09±0.04 with a highly significant difference p<0.001. The mean of anti-IgM goat antibodies was 2.13±0.23 compared to the control group 0.08±0.04 with a highly significant difference p<0.001. finally, the mean of anti-IgG antibodies was 1.27±0.12 compared to the control group 0.09±0.04 with a highly significant difference p<0.001.

Keywords- Crimean-Congo hemorrhagic fever Virus (CCHF), animals, Human, Diyala Province.

I. INTRODUCTION

The virus Crimean-Congo hemorrhagic fever (CCHF) belongs to the family *Bunyaviridae* and genus *Nairovirus*. The genome of the virus is composed of 3 RNA segments: 12 Kb (L), 6.8 Kb (M) and 3 Kb (S) [1]. The (CCHF) virus is the most commonly prevalent tick borne viral infection in the world, and it was described in many parts of Africa, Asia and the Middle East [2]. The geographical distribution of CCHF virus mostly matches with those of members of tick genera, and the main source of infection to humans is the Hyalomma tick [3]. On contrary to human infections, infection with CCHF virus is without symptoms in all species. There are limited treatment options for CCHF infection, and immunotherapies with ribavirin are active to treat. The effectiveness of CCHF treatment with ribavirin has not yet been confirmed [4]. The Crimean Congo hemorrhagic fever is considered a main health challenge because of its load on economic and social conditions in addition to its impact on people's health [5]. Although there are public health methods for controling and preventing CCHF spread, there has been a rise in its global incidence, such as in the Eastern Mediterranean part, in the last ten years because of the disease's nature, human behaviors, ecological and environmental factor as well as the improvement in diagnostic procedures [6]. In 60–80% of cases, the Crimean Congo hemorrhagic fever is without symptoms, while 20–40% of them often suffer from initial fever, headache and malaise and gastrointestinal symptoms. The serious cases may show bleeding, shock and multi organ failures [7]. The geographical

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distributions of the disease are connected with the hard tick vector distribution, which belongs mainly to the *Hyalomma marginatum* family in Asia, Africa and Europe [8]. Iran and Turkey that are situated in the east and north of Iraq, are CCHF-endemic and it is reported that there is a recent outbreak and an elevated number of CCHF cases [9]. In a seroepidemiologic study in 2016 on CCHF in camels, cattles and sheep, it was revealed that the incidence rate of 20–30% was in Iraq, Turkey and Iran. However, the CCHF incidence in goats was higher in these three countries (50%) [10]. The aim of this study was to detect CCFHV distribution between animals and Humans.

II. MATERIALS AND METHODS

In the current study, 30 blood samples were collected from Human patients infected with CCHF virus residing in Alrazi Hospital, 30 samples from cattles and 30 from goats from the veterinary medical clinic in Baquba city. Also, 15 blood samples were taken from healthy individuals, 15 samples from healthy cattles and 15 samples from healthy goats as control groups. The study was carried out during the period from, 15th January to 30th June 2023 in Diyala Province. From each participant, 5 ml of blood was obtained. Principle of the Assay: the human Crimean Congo hemorrhagic fever ELISA Kit quantitates CCHF IgG and IgM in the specimens. The antigen is precoated on a microplate. Test samples and standards are put in the wells, incubated and washed. Then, HRP conjugated antigens are added and incubated. The plates are washed again, and chromogen solutions are added which HRP catalyzes, to generate a blue color following incubation. The stop solution is added to change the color to yellow, and it is then read at 450 nm, which is proportional to the analyte bound amounts. Animals Elisa kit of anti IgM and anti IgG antibodies, the sensitivity and range are subject to changes.

Statistical analysis: Data were statistically analyzed using the SPSS-20 program, including the t-test. The ($P < 0.05$) value is regarded significant.

III. RESULTS

The (Mean±S.E) of Human anti IgM antibodies was 2.40±0.26 in patients with CCHF and 2.13±0.23 in cattles with non-significant differences, while the (Mean±S.E) of anti IgM antibodies was 1.72±0.15 in goats with a significant difference between goats and humans (p=0.03). The (Mean±S.E) of Human anti IgG antibodies was 1.42±0.11 in patients with CCHF and 1.27±0.12 in cattles with non-significant differences. Also, the mean ±S.E of anti IgG was 1.24±0.11 in goats with non-significant differences between the animals and Humans, as shown in table 1.

Table 1: Distribution of CCHF IgM and IgG between human and animals

Parameter	Patients Groups	(Mean±S.E)	P value
IgM	**Human**	**2.40±0.26** [a]	**0.095 NS**
	Cattle	**2.13±0.23**	
	Goat	1.72±0.15 [a]	
IgG	**Human**	1.42±0.11	**0.47 NS**
	Cattle	1.27±0.12	
	Goat	1.24±0.11	

NS= Non-Significant
A significant differences (p=0.03) between Human CCHF and Goat in IgM

The mean ±S.E of anti-IgM Human antibodies was 2.40±0.26 compared to the control group 0.08±0.05 with a highly significant difference p<0.001. The mean of anti-IgG human antibodies was 1.42±0.11 compared to the control group 0.13±0.06 with a highly significant difference p<0.001 as shown in table 2.

Table 2: Distribution of CCFH IgM and IgG in Humans and control group

Parameter	Groups	(Mean±S.E)	P value
CCHF IgM	**Control**	0.08±0.05	<0.001**
	Patients	2.40±0.26	
CCHF IgG	**Control**	0.13±0.06	<0.001**
	Patients	1.42±0.11	

** Significant differences

The mean of anti-IgM cattle antibodies was 2.13±0.23 compared to the control group 0.08±0.04, with a highly significant difference p<0.001. The mean of anti-IgG antibodies was 1.27±0.12 compared to the control group 0.09±0.04 with a highly significant difference p<0.001 as shown in table 3.

Table 3: Distribution of CCFH IgM and IgG in cattles and control group

Parameter	Groups	(Mean±S.E)	P value
Cattle IgM	**Control**	0.08±0.04	<0.001**
	Patients	2.13±0.23	
Cattle IgG	**Control**	0.09±0.04	<0.001**
	Patients	1.27±0.12	

** Significant differences

The mean of anti-IgM antibodies was 2.13±0.23 compared to the control group 0.08±0.04 with a highly significant difference p<0.001. The mean of anti-IgG antibodies was 1.27±0.12 compared to the control group 0.09±0.04 with a highly significant difference p<0.001, as shown in table 4.

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Table 4: Distribution of CCFH IgM and IgG in goats and control group

Parameter	Groups	(Mean±S.E)	P value
Goats IgM	**Control**	0.19±0.06	<0.001**
	Patients	1.72±0.15	
Goats IgG	**Control**	0.13±0.05	<0.001**
	Patients	1.24±0.11	

The mean of anti-IgM antibodies of males was 2.19±0.32 compared to females 2.63±0.43 with non-significant difference p=0.41. The mean of anti-IgG antibodies of males was 1.41±0.14 compared to the females 1.44±0.17 with non-significant difference p=0.87, as shown in table 5.

Table 5: Distribution of CCFH IgM and IgG in male and female Human patients

Parameter	Patients gender	(Mean±S.E)	P value
CCHF IgM	**Male**	2.19±0.32	0.41 NS
	Female	2.63±0.43	
CCHF IgG	**Male**	1.41±0.14	0.87 NS
	Female	1.44±0.17	

NS= Non-Significant

The mean of anti-IgM antibodies in the age group ≤25 was (2.19±0.38), while in the age group ≥25 was (2.54±0.37) with non-significant difference p=0.53. The mean of anti-IgG antibodies in the age group ≤25 was (1.26±0.18), but in the age group ≥25 was (1.53±0.13) with non-significant difference p=0.23, as shown in table 6.

Table 6: Distribution of CCHF IgM and IgG in human patients according to age

Parameter	Patients age groups (Yrs.)	(Mean±S.E)	P value
CCHF IgM	**≤25**	2.19±0.38	0.53 NS
	≥25	2.54±0.37	
CCHF IgG	**≤25**	1.26±0.18	0.23 NS
	≥25	1.53±0.13	

NS= Non-Significant

Table 7 showed that the mean of anti-IgM antibodies in Rural residents was 2.44±0.38 compared to Urban residents 2.36±0.37 with non-significant difference p=0.88. The mean of anti-IgG antibodies in Rural residents was 1.27±0.14 compared to Urban residents 1.58±0.15 p=0. 0.15.

Table 7: Distribution of CCHF IgM and IgG in human patients according to residency

Parameter	Patients geographic area	(Mean±S.E)	P value
CCHF IgM	**Rural**	2.44±0.38	0.88 NS
	Urban	2.36±0.37	
CCHF IgG	**Rural**	1.27±0.14	0.15 NS
	Urban	1.58±0.15	

NS= Non-Significant

IV. DISCUSSION

Crimean-Congo hemorrhagic fever virus (CCHFV) is a serious viral disease that leads to death. According to the results, the (Mean±S.E) of Human anti IgM antibodies was 2.40±0.26 in patients with CCHF and 2.13±0.23 in cattles with non-significant differences, while the (Mean±S.E) of anti IgM antibodies was 1.72±0.15 in goats with a significant difference between goats and humans (p=0.03). The (Mean±S.E) of Human anti IgG antibodies was 1.42±0.11 in patients with CCHF and 1.27±0.12 in cattles with non-significant differences. Also, the mean ±S.E of anti IgG was 1.24±0.11 in goats with non-significant differences between the animals and Humans. Omoga, et al, (2023) has proven that there is a direct relationship in the levels of antibodies in the acute phase of the disease among animals with humans, and this relationship made it clear that the spread of infection between animals and contact had very high distribution [11]. Also Atim, et al, (2023) concluded that in the case of chronic disease in livestock and humans, there was a noticeable increase in the levels of IgG antibodies compared to both parties. It was found that these antibodies increased in the sera of livestock and humans at a similar level [12]. Wangchuk, et al, (2016) found high levels of IgG and suggested that when goats showed positive for CCHFV, it indicates that they have were either bred within households that keep goat herd or acquired it from another village in the area. There is no certain exact source for these seropositive goats. Nevertheless, in some previous examples, breeding goats (males & females) were obtained from India by the Bhutan governments and spread to farmers for improvement of their breeding. It is also believed that cross border animal movements and unofficial goat import by farmers along the porous borders of southern Bhutan probably happened. In addition, large numbers of dairy cattles were brought yearly from India toenhance milk production and breeding purpose. Not all imported goats and cattles are tested for CCHF due to deficit diagnostic facilities and negligible happening of human CCHF [13]. Furthermore, there was significant differences (p=0.03) between Human CCHF and Goat in IgM. There was no significant difference between the infections of goats and humans in the spread of acute

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infection, in which the IGM antibody recorded a relative increase in humans than in goats. Several people from the same animal may have been infected, so there are differences between these infections, and these findings agreed with (Emmerich, et al, 2021) [14]. While there were very high significant differences found between human, cattle, and goat anti- IgM and anti- IgG antibodies respectively, compared to the control groups. The study proved that there is a wide spread of infections among animals with this dangerous virus, and that there is a high concentration of IgM and IgG in the sera of those animals, in addition to the infection of humans due to contact with those animals, and this study also proved that there is a direct and rapid distribution of infections and transmission from animals to humans. This result is consistent with (El Ghassem, et al, 2023) in Diyala Province who explained this danger: the relationship between humans and domestic animals that transmit the hemorrhagic fever virus [15], these infections are considered zoonotic diseases that not like Simplex Virus-2 of Humans Infection [16].

V. CONCLUSIONS

According to the results, there were significant differences in the distribution of CCFHV among Human patients and animals in Diyala Province.

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