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SOME EPIDEMIOLOGICAL STUDY OF RIFT VALLEY FEVER (RVF) IN CENTRAL SUDAN

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INTRODUCTION

Rift Valley fever (RVF) is one of the most serious Transboundary, infectious diseases. It is a mosquito-borne viral zoonotics disease, which causes periodic severe epidemics, principally characterized by high mortality rate of young animals and abortion in pregnant ruminants such as sheep, goats, and cattle following heavy rain falls in sub Saharan Africa. The disease is also transmitted to humans through mosquito bites or, handling of infected animal tissues, (Eisa *et al*., 1977, Lefevre, 1997). Rift Valley Fever virus (RVFV) of the family *Bunyaviridae* is the cause of RVF infection (Daubney *et al*., 1930). Since the first isolation of the virus in 1930s, there have been several epizootics outbreaks in tropic mainly in Africa including Sudan, which is one of the largest countries in Africa (Adam *et al*).

OBJECTIVE

To determine potential risk factors associated with RVF occurrence in Elgezira, White Nile, Sinnar and Blue Nile states

MATERIAL AND METHOD

Study area

The study was conducted on sheep and goats herds in White Nile, Elgezira, Sinnar, Blue Nile States.

STUDY DESIGN

Study population

The study was primarily focused on sheep and goats herd as reference or target population, besides collecting additional information about other susceptible species like cattle and camels available in the study area.

Sampling frame and sample size Determination

The cross sectional study design was carried out to determine the seroprevalence of RVF in small ruminants in 2007.

Serum sample was collected, using multistage random sampling technique for the selection of the primary sampling unit to sample one local authority, and one administrative authority within each sampled local authority.

The sampling size was calculated for an expected prevalence of 33% (Eisa, 1984), and a 5% desired absolute precision and 95% confidence level by using the following formula (Thrusfield, 2007).

$$n = \frac{1.962^2 \, Pexp \, (1 - Pexp)}{d^2}$$

Number of animals sampled was 218 calculated for doing the study on number of sera collected

Serum sample collection and testing

Blood samples were collected using plane vacutainers (10 ml.) and were allowed to clot for up to 24 hours in the shade. Two aliquots of sera were transferred into cryovials identifying sheep and goats from designated geographic localities in the study area. The cryo vials were kept in -20 C° and transferred to the laboratory in cooled containers with ice bags.

Serological diagnosis was carried out on collected specimens to demonstrate the presence of IgM immunoglobulines by using Enzyme Linked Immunosorbent Assay (ELISA) at the Veterinary Research Institute (VRI), Rift Valley Fever Unit in Sudan.

Immunocapture ELISA for the detection of anti-RVFV IgM Antibody (BDSL-UK)

Commercial ELISA kits for determination of RVFV IgM antibody were purchased from Biological Diagnostic Supplies (BDSL; United Kingdom). The ELISA was based on a capture format in which the plates were coated with rabbit anti-sheep IgM capture antibody

and then reacted with test sera. Anti sheep capture antibody can be used for detection of IgM in sheep, goats and cattle. The capture IgM antibody would react with RVF antigen, and the bounded antigen would then be detected with mouse anti-RVF antibody and anti-mouse horseradish peroxidase (HRPO) conjugate plus ABTS substrate.

Sero-prevalence estimation

RVF sero-prevalence was estimated by calculating the proportion of the positive cases by the test as nominator and sampled population of sheep and goats as denominator in the study area at given point in time.

Statistical data analysis

The collected data was organized and managed according to the type of variables using Microsoft Excel spreadsheet to be ready for analysis using relevant statistical software package such as statistical package for social sciences (SPSS). To investigate risk factors associated with RVF, the data was analyzed by univariate analysis using the Chi Square test or univariate odds ratio (for qualitative data) and then multivariate analysis using Logistic regression.

RESULT

Descriptive statistics are shown in table. Gezira state showed frequency of 110 (50.9%), 30 %(13.9%) in Blue Nile while Sinnar state had frequency of 10 (4.6%) and White Nile state had 66 (30.6%) shown.

Table1: showing frequency and percentage of RVF antibodies +ve samples of state studied.

State	Frequency	Percent
Gezira	110	50.9
Blue Nile	30	13.9
sinnar	10	4.6
White Nile	66	30.6
Total	**216**	**100.0**

The frequencies of positive samples were 110(50.9%) in Gezira states, 30(13.9%) in Blue Nile states, 10(4.6%) in Sinnar states, and 66(30.6%) in White Nile States.

Descriptive statistic showed goats with frequency of 81 (37.5%), while sheep had 65 (30.1%) and cattle had frequency of 70 (32.4%), (table 2).

Table2: showing frequency and percentage of species studied.

Species	Frequency	Percent
Goats	81	37.5
Sheep	65	30.1
Cattle	70	32.4
Total	**216**	**100.0**

Overall prevalence was 31 %. Gizera as well as Sinnar states recorded a prevalence of 40% as well as Sinnar state the prevalence was 40%. While White Nile state the prevalence was 23% while Blue Nile state recorded a prevalence of 17%, (figure 1.)

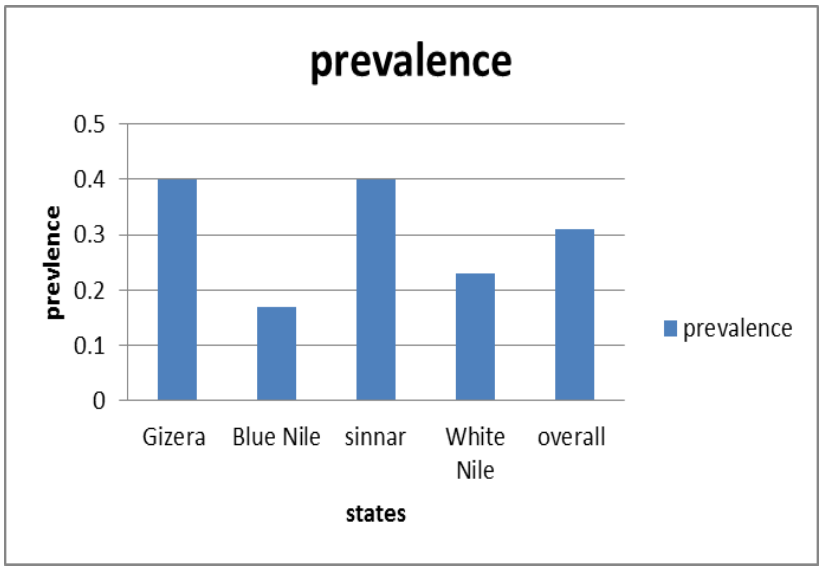

Figure 1: Prevalence of RVF in Gizera, BlueNile, and Sinnar and White Nile state.

Univariate analysis of state and species shows no association with RVF sero-positivity. This is explained in table 3 below.

Table3: univariate analysis of state and species with association of RVF seropositivity.

Risk factor	df	Sig.
State	3	.162
Species	2	.079

In multivariate model analysis the state showed no association with RVF sero-positivity, while the species revealed that there was an association with RVF-seropositivity in goat (P value ≤0.05). (Table 4.)

Table4: Multivariate analysis of risk factors state and species with association with RVF seropositivity.

Risk factor	df	Exp(B)	Sig.
Gizera	3	.204	.109
Sinnar	1	1.777	.133
White Nile	1	.717	.577
Blue Nile	1	3.275	.120
Sheep	2	.250	.090
Cattle	1	1.519	.386
Goat	1	2.596	.044

DISCUSSION

The study aimed to investigate the risk factors of location and species and their association with sero-positivity of RVF. This cross sectional Sero-survey was carried out in 2007 heavy rain falls

In all studied areas that were accompanied by presence of unusually high population densities of mosquitoes including Aedes spp.

The Study revealed an overall prevalence of 31%, earlier studies indicated that had the prevalence of RVF antibodies have shown a marked seasonal pattern, with the infection level being higher in the rainy months which coincided with a high population density of the invertebrate vectors (Eisa *et al*., 1980). The highest prevalence recorded here in was 40% in Gezira and Sinnar states by using ELISA test, while Eisa et al, in 1984 reported highest prevalence of 50% in juba and Shendi by using precipitating antibodies to RVF virus antigen, this could be due to difference in the test used in the study.

Species wise three species undertaken only goats were significantly associated with sero-positivity of RVF in multivariate model of the study; however, RVF is an epizootic disease which can infect human.

Fever, sweating, headache, chills. None of the patients presented with hemorrhagic symptoms and there was no death. Out of these149 patients, 107 (71.8%) were male, 60(40.3%) were illiterate, 80(53.7%) were rural residence (Hassanain *et al).*

Considering test performance characteristic of ELISA test used, the test has been extensively validated using field, experimental and post vaccination sera panels from South Africa. In known RVF-free sheep, goats and cattle the diagnostic specificity was 98.7 %, 99.7 % and

100 %, respectively. In infected animals IgM antibody can be detected as early as 4 days post infection (dpi). However, due to the transitory presence of IgM antibody in sera of RVF-infected animals, the ELISA sensitivity is influenced by the time at which post infection specimens are taken for testing. For example the test was shown 100 % sensitive in experimental sheep tested 5-42 dpi. For the diagnostic interpretation of ELISA results, it is essential that the threshold be reflective of the population of animals to which the test is being applied. Therefore, it is generally recommended that re-adjustment of threshold values be considered for each specific population of animals subjected to testing by the ELISA.

CONCLUSION

Overall prevalence of RVF in the studied area was 31 %. The highest prevalence was recorded in Gezira state as well as Sinnar state, while the lowest prevalence was recorded in Blue Nile state. Univariate analysis revealed that there is now significant association of state and species with sero-positivity of RVF. While multivariate model showed that goats are associated with sero-positivity of RVF.

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