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Rift valley fever in Sudan: Assessing public awareness and preventive practices in Al-Karad

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Abstract

Rift Valley Fever (RVF) is a zoonotic disease that affects animals and poses a risk to humans, with significant public health and economic implications in Sudan due to its dependence on livestock. This cross-sectional study investigates the knowledge, attitudes, and practices (KAP) related to RVF among residents of Al-Karad, Sudan. The study surveyed 100 households selected through systematic random sampling. Data were collected via a structured questionnaire covering demographics, household characteristics, knowledge, attitudes, and preventive practices related to RVF. SPSS was used for analysis, employing descriptive and inferential statistics, including Chi-square tests and logistic regression, to assess associations between demographic factors and KAP levels. The findings show low awareness, with only 48% of participants having heard of RVF. Knowledge gaps were prevalent, as 68% did not know how the disease spreads, and 73% were unaware of its seasonal transmission. Despite this, 57% had positive attitudes toward prevention. Gender distinctions were noted, with females showing better knowledge and attitudes, while males had better animal waste disposal practices. Risky behaviors, like eating raw meat and drinking raw milk, were minimal (8% and 7%, respectively). The study highlights the demand for enhanced health education and targeted interventions to address these gaps and enhance prevention strategies, particularly in a region vulnerable to RVF outbreaks. *(Afr J Reprod Health 2025; 29 [5]: 191-202).*

Keywords: Rift Valley Fever, Sudan, Knowledge, Attitudes, Practices

Résumé

La fièvre de la vallée du Rift (FVR) est une zoonose qui touche les animaux et présente un risque pour l'homme. Elle a d'importantes répercussions sanitaires et économiques au Soudan, en raison de sa dépendance à l'élevage. Cette étude transversale examine les connaissances, attitudes et pratiques (CAP) liées à la FVR chez les habitants d'Al-Karad, au Soudan. L'étude a porté sur 100 ménages sélectionnés par échantillonnage aléatoire systématique. Les données ont été collectées au moyen d'un questionnaire structuré portant sur les données démographiques, les caractéristiques des ménages, les connaissances, les attitudes et les pratiques préventives liées à la FVR. L'analyse a été réalisée avec SPSS, utilisant des statistiques descriptives et inférentielles, notamment des tests du khi carré et une régression logistique, afin d'évaluer les associations entre les facteurs démographiques et les niveaux de CAP. Les résultats montrent une faible sensibilisation : seulement 48 % des participants avaient entendu parler de la FVR. Les lacunes en matière de connaissances étaient importantes : 68 % ignoraient le mode de propagation de la maladie et 73 % ignoraient sa transmission saisonnière. Malgré cela, 57 % avaient une attitude positive envers la prévention. Des différences entre les sexes ont été observées : les femmes présentaient de meilleures connaissances et attitudes, tandis que les hommes avaient de meilleures pratiques d'élimination des déjections animales. Les comportements à risque, comme la consommation de viande crue et de lait cru, étaient minimes (8 % et 7 % respectivement). L'étude souligne la nécessité d'une meilleure éducation sanitaire et d'interventions ciblées pour combler ces lacunes et améliorer les stratégies de prévention, en particulier dans une région vulnérable aux épidémies de FVR. *(Afr J Reprod Health 2025; 29 [5]: 191-202).*

Mots-clés: Fièvre de la Vallée du Rift, Soudan, Connaissances, Attitudes, Pratiques

Introduction

Rift Valley Fever (RVF) is a zoonotic infectious disease that is spread by mosquitoes and is categorized as haemorrhagic fever. The causative agent of the disease is the Rift Valley fever virus (RVFV), which is regarded as one of the most dangerous pathogens in Africa.[1,2] RVFV belongs to

the Phlebovirus genus and the Bunyaviridae family, alongside nine other species.[3] The virus is primarily spread by mosquitoes, particularly those in the Aedes and Culex genera.[4] The disease manifests in a broad range, varying from mild symptoms to fatal outcomes, and affects wildlife, domesticated animals, and humans.[5] Environmental factors, such as flooding and changing temperatures, contribute significantly to the transmission dynamics of RVF, as they influence mosquito breeding patterns and virus amplification in animal populations.[6]

The persistence of RVF remains a significant concern for Sudan and other countries in African and middle east, where the virus has caused recurrent outbreaks, often with substantial human and animal health consequences.[7] Outbreaks of RFV had devastating impact on human health and the economy of cattle ranchers.[8,9] Sudan, with Africa's second-largest livestock population, relies heavily on livestock for both food and income, making the management of RVF spread even more complex.[10] The economic toll of RVF is substantial, as it disrupts agricultural productivity, decimates livestock populations, and leads to trade restrictions, all of which significantly affect national economies and food security.[11]

Sudan has experienced multiple recorded RVF outbreaks, with the first occurring in 1973, followed by another in 1976. Subsequent outbreaks occurred in 2007 and 2008, causing considerable public health and economic repercussions, including numerous human cases and fatalities. Due to the absence of efficient health surveillance systems, accurately assessing the impact of RVF on livestock remains challenging.[12] A recent outbreak in 2019 highlighted significant delays in data sharing and response to health concerns, revealing gaps in the system's ability to manage outbreaks effectively.[13]

RVF remains a neglected public health issue, exacerbated by knowledge gaps within communities and inadequate surveillance of both human and animal populations. Earlier research has pointed out these problems and emphasized the significance of local involvement in both engagement and surveillance efforts for the effective management of outbreaks.[12,13]

Although certain initiatives have been undertaken regarding vaccination campaigns and vector control, challenges remain concerning consistent implementation and reach, particularly in rural and isolated areas.

Addressing these challenges is crucial to preventing future outbreaks.[14] Considering the rising frequency of RVF outbreaks and the possibilities for future public health crises, this study is both timely and essential for formulating successful prevention techniques and enhancing public health preparedness. The situation highlights the necessity for comprehensive knowledge, attitude, and practice (KAP) studies, particularly given the growing threat associated with arboviral diseases, human migration, and ongoing conflicts in Sudan.

The objectives of this study are as follows:

1. To assess the knowledge, attitude, and practices related to Rift Valley Fever among the residents of Al-Karad, Sudan.
2. To explore the impact of gender on KAP regarding RFV.
3. To evaluate gaps in knowledge or misconceptions about RVF transmission, prevention, and control.

To provide suggestions for health education initiatives aimed at improving RVF awareness and preventive practices.

Methods

Study design

A cross-sectional, descriptive study was carried out to evaluate the knowledge, attitudes, and practices (KAP) regarding Rift Valley Fever (RVF) among residents of Al-Karad, Sudan.

Study area

The research was conducted in Al-Karad, a region located in Al Dabba city, part of Al Shimalya state, the largest state in Sudan. Al-Karad is known for its livestock herding and agricultural activities, with many residents relying on these industries for their livelihoods.

The area is situated near the Nile River, providing a vital source of water for both individuals and their

animals. The community in Al-Karad is predominantly composed of individuals from one or two ethnic groups, and the district has close-knit familial ties.

Study population

The study targeted adults aged 18 years and older, residing in Al-Karad region.

Sample size

The number of samples was determined using the formula:

$n = (Z^2 \times p \times (1 - p)) / d^2$

Where:

n = sample size estimate

Z = 1.96 (standard normal variety at 5% error)

p = assumed proportion of individuals with knowledge of RVF (50%)

(1-p) = probability of not having knowledge

d = desired precision or margin of error (5%)

Based on this calculation, the initial necessary sample size was 176 households. However, the ultimate sample size was decreased to 100 due to factors such as limited access to eligible participants, logistical constraints, funding issues, cultural barriers, time limitations, and difficulties in reaching individuals residing in rural areas.

Sampling method

A systematic random sampling method was employed to select households for participation. A sampling frame of all eligible households was first established, and a fixed interval (nth value =10) was determined based on the total number of households and the required sample size. The first household was randomly selected within the initial interval, and subsequent households were chosen systematically at equal intervals. This approach ensured that each household had an equal probability of selection, minimizing selection bias and enhancing the representativeness of the sample.

Data collection tools

Data were gathered using a structured questionnaire designed to collect information in five key categories:

1. Respondent demographics (e.g., age, gender, occupation, education level)
2. Household characteristics (e.g., type of dwelling, livestock ownership)
3. Knowledge of RVF virus vectors, transmission modes, and clinical signs in both humans and animals.
4. Attitudes toward RVF management (e.g., perception of risk, awareness of control measures)
5. Preventive practices against RVF (e.g., vaccination of animals, use of protective measures).

Data collection procedure

The data collection was conducted by trained interviewers who administered the questionnaire through face-to-face interviews. The interviewers were thoroughly trained to ensure consistency and reliability in data collection, while maintaining a respectful and neutral stance throughout the process.

The reliability and validity of the questionnaire were assessed before the study. Content validity was ensured through expert review, where subject matter specialists evaluated the questionnaire for clarity, relevance, and comprehensiveness.

A pilot study was conducted with a subset of households (not included in the final sample) to test the questionnaire's reliability. Internal consistency was measured using Cronbach's alpha, yielding a value of 0.85, indicating acceptable reliability. Additionally, test-retest reliability was assessed over a two-week interval, producing a correlation coefficient of 0.80, demonstrating stability over time.

Necessary modifications were made based on pilot study feedback to enhance clarity and ensure accurate data collection.

Data analysis

Data were analyzed using SPSS software. Descriptive statistics (such as frequencies and percentages) were employed to summarize the KAP of participants regarding RVF. Inferential statistics, including chi-square tests and logistic regression, were utilized to examine the connection between demographic factors and participants' KAP levels. This helped recognize any important connections between personal characteristics and knowledge or practices related to RVF.

Ethical considerations

Informed Verbal consent was obtained from each participant prior to the data collection process. Participants received detailed information regarding the study's aims and were informed of their right to decline participation or withdraw at any moment without repercussions. The confidentiality and anonymity of the participants were rigorously upheld during the entirety of the study. Ethical clearance for the research was obtained from the Department of Community Medicine, University of Khartoum, Sudan.

A total of 100 participants were involved in the study. The majority had either primary education (38%) or high school education (33%). A significant proportion were farmers (35%), followed by freelancers (29%), and a small percentage were unemployed (6%).

Results

A total of 100 participants were involved in the study. The majority had either primary education (38%) or high school education (33%). A significant proportion were farmers (35%), followed by freelancers (29%), and a small percentage were unemployed (6%).

Knowledge about RVF

As shown in table 2: The knowledge of participants regarding Rift Valley Fever (RVF) was limited. Only 48% of respondents had heard of RVF. Among those who had, the most commonly recognized symptoms were fever and weight loss (58%), followed by bleeding (17%) and inflammation of the eye (8%). Additionally, 75% of participants believed that RVF could be diagnosed using current medical tests. However, 73% were unaware of the seasonal spread of RVF, and 68% did not know how the disease is transmitted. Only a small percentage identified specific methods of transmission, like drinking raw milk (5%), eating undercooked meat (5%), and mosquito bites (6%).

Preventive measures were mentioned by 47% of participants as vaccinations, and 25% indicated that cleaning their houses could help prevent or reflect the disease.

Attitudes toward RVF Infection

Views on RFV infection appear in Table 3. Forty-five percent of respondents were unclear if RVF patients needed to be segregated. If their neighbors were infected with RVF, 25% would continue to interact normally, 24% would avoid contact, and 51% responded "don’t know."

When it came to the role in controlling RVF, 18% of participants believed health authorities should handle it, 4% believed veterinary authorities should, and 11% thought the community should be responsible. A large proportion (29%) were unsure about the function of the community.

Health education was the most frequently encountered method suggested to confront RVF (46%), followed by improving hygiene measures at home (15%). A significant number of participants (47%) expressed that they would pursue medical treatment if they contracted RVF.

Practices related to animals and animal products

Regarding practices, 8% of participants reported eating raw meat, and 7% consumed raw milk. Nearly half (49%) of participants disposed of dead animals by throwing them outside the house. A significant majority (86%) slaughter animals inside their homes. The disposal of slaughter waste was commonly done by throwing it outside the house in the street (46%), while 32% buried it, and 16% burned it.

Table 1: Demographic characteristics of participants.

Variable	Category	Frequency (n=100)	Percentage
Gender	Male	48	48%
	Female	52	52%
Age group	18 – 20	4	4%
	21 – 40	35	35%
	41 – 60	27	27%
	More than 60	7	7%
Marital status	Single	31	31%
	Married	64	64%
	Widowed	5	5%
Level of education	Illiterate	12	12%
	Religious education	2	2%
	Primary	38	38%
	High school	33	33%
	University	15	15%
Occupation	Student	3	3%
	Farmer	12	35%
	Herdsman	1	1%
	Housewife	35	12%
	Teacher	4	4%
	Freelancer	29	29%
	Employee	10	10%
	Unemployed	6	6%
Breeding animals	Yes	39	39%
	No	61	61%

Table 2: Knowledge about RVF

Variable	Category	**Frequency** (n=100)	Percentage
Heard of RVF	Yes	48	48%
	No	52	52%
Host of RVF	Humans	11	11%
	Animals	22	22%
	Both humans and animals	19	19%
	Mosquitoes	10	10%
	Don’t know	38	38%
Cause of RVF	Bacteria	7	7%
	Fungal	3	3%
	Virus	16	16%
	Don’t know	74	74%
	Don’t know	76	76%
Symptoms of RVF	Abdominal pain	2	2%
	Shortness of breath	1	1%
	Eye inflammation	2	2%
	Fever and weight loss	5	5%

	Haemorrhage	4	4%
	Neurological symptoms and convulsions	1	1%
Medical tests for RVF patients	Yes	75	75%
	No	25	25%
During which season RVF spread more	Autumn	20	20%
	Don't know	42	42%
	Summer	26	26%
	Winter	12	12%
Avoidance of RVF	All of them	18	18%
	Avoid eating undercooked meat	5	5%
	Avoid handling sick animals	3	3%
	Cleaning the house	3	3%
	Don't know	68	68%
	Vaccination	3	3%
Transmission of RVF	All of them	4	4%
	Direct interaction with affected animals	14	14%
	Don't know	66	66%
	Drinking raw milk	5	5%
	Eating uncooked meat	5	5%
	Mosquitoes' bites	6	6%

Table 3: The Attitudes and behaviours toward RVF

Variable	Category	Frequency (n=100)	Proportion
If you suspect that you have RVF, where would you go	Don't know	1	1%
	Governmental hospital	56	56%
	Primary health care centre	10	10%
	Stay at home	23	23%
	Private hospital	10	10%
In your opinion, what type of treatment would be appropriate	Don't know	39	39%
	Medical treatment	47	47%
	Medical treatment and traditional treatment	12	12%
	Traditional treatment	2	2%
If your neighbour or someone from the village get RVF, how do you react	Avoid contact	22	22%
	Careful contact	3	3%
	Don't know	50	50%

	Keep dealing normally	25	25%
Do you think RVF patients should be isolated	Don't know	45	45%
	No	27	27%
	Yes	28	28%
In your opinion, what are the necessary disciplines together to control RVF	All of them	5	5%
	Community	11	11%
	Don't know	59	59%
	Environmental authorities	3	3%
	Health authorities	18	18%
	Veterinary authorities	4	4%
In your opinion What function does the community serve in confronting RVF	All of them	22	22%
	Animal isolation	2	2%
	Destroy the man-made mosquito habitats	4	4%
	Don't know	29	29%
	Health education	28	28%
	Improve hygienic measure at home	15	15%

Table 4: Practices regarding prevention and control of RVF

Variable	Category	Frequency (n=100)	Proportion
Do you eat uncooked meat	No	92	92%
	Yes	8	8%
Do you drink raw milk	No	93	93%
	Yes	7	7%
How do you handle dead animals	Burn them	16	16%
	Bury them	25	25%
	Throw them at sea	10	10%
	Throw them away outside home	49	49%
Do you buy the meat of animals that Slaughter in the Slaughterhouse under veterinary supervision	No	58	58%
	Yes	42	42%
Are you Slaughtering animals for meat inside the house	No	14	14%
	Yes	86	86%
How do you get rid of the waste when slaughtering animals at home	Burn them	16	16%
	Bury them	32	32%
	Don't know	4	4%
	Throw them at sea	2	2%
	Throw them away outside the house	46	46%

Table 5: Relation between gender and knowledge

Variable	Category	Good knowledge (%)	Poor knowledge (%)	P value
What is the cause of RVF	Female	12 (23%)	40 (77%)	0.045
	Male	4 (8.4%)	44 (91.6%)	
How can a person get RVF	Female	23 (44.2%)	29 (55.8%)	0.025
	Male	11 (23%)	37 (77%)	
What are the symptoms of RVF	Female	17 (32.6%)	35 (67.4%)	0.034
	Male	7 (14.6%)	41 (85.4%)	
How can a person avoid infection with RVF	Female	23 (44.3%)	29 (55.7%)	0.000
	Male	6 (12.5%)	42 (87.5%)	
Does a patient with RVF need medical tests	Female	48 (92.3%)	4 (7.7%)	0.000
	Male	27 (56.2%)	21 (43.8%)	

Table 6: Relation between gender and attitude

Variable	Category	Good attitude (%)	Poor attitude (%)	P-Value
If you think that you might have RVF, where would you go	Female	47 (90%)	5 (10%)	0.002
	Male	31 (64.5%)	17 (35.5%)	
In your opinion what type of treatment would be appropriate	Female	40 (77%)	12 (23%)	0.000
	Male	19 (40%)	29 (60%)	
In your opinion What are the necessary disciplines together to control RVF	Female	32 (61.5%)	20 (38.5%)	0.000
	Male	9 (18.8%)	39 (81.2%)	

Table 7: Relation between gender and practice

Variable	Category	Good practice (%)	Poor practice (%)	P-Value
How do you handle dead animals	Female	12 (23%)	40 (77%)	0.009
	Male	23 (48%)	25 (52%)	
Are you Slaughtering animals for meat inside the house	Female	3 (5.8%)	49 (94.2%)	0.014
	Male	11 (23%)	37 (77%)	
How do you get rid of the waste when slaughtering animals at home	Female	15 (28.8%)	37 (71.%)	0.000
	Male	33 (68.8%)	15 (31.2%)	

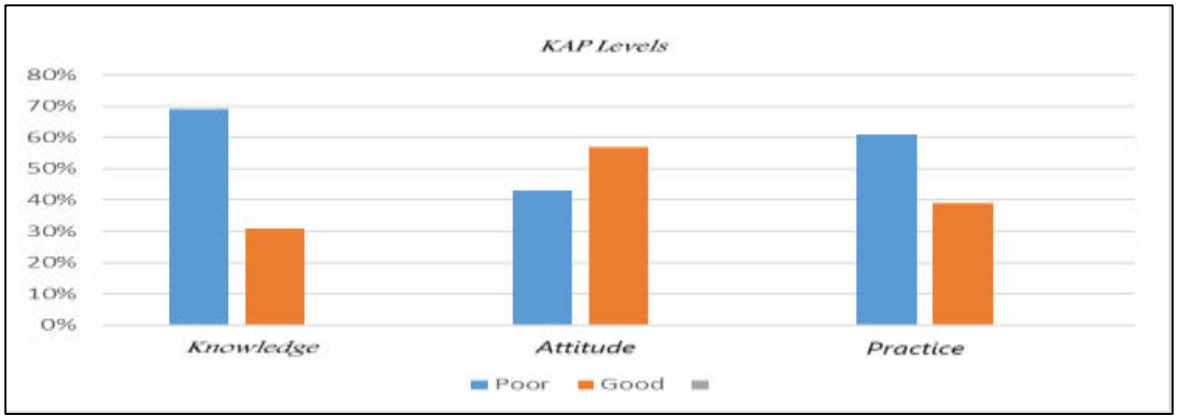

Figure 1: KAP scale

KAP scale

As shown in **Figure 1**, the overall knowledge about RVF was poor, with only 31% of participants demonstrating good knowledge. In terms of attitudes, 57% had a positive attitude toward RVF prevention, while 61% exhibited poor practices in terms of prevention and control.

Gender differences

Tables 5, 6, and 7 show significant gender differences in knowledge, attitudes, and practices related to RVF. For instance, females were more inclined to know the cause, symptoms, and transmission methods of RVF compared to males. Similarly, females had better attitudes and practices regarding the treatment and prevention of RVF.

Discussion

This is a cross-sectional study conducted in Al-Karad, located in the northern state of Sudan. This study highlights a potential public health disaster, considering Sudan's history of outbreaks due to Rift Valley Fever (RVF). The knowledge about RVF among the respondents was notably low, with only 48% aware of the disease. This lack of awareness appears to be a widespread issue, not limited to specific demographic groups, suggesting a broader failure in public health messaging and educational efforts.

One of the primary challenges is the high prevalence of misconceptions about RVF transmission. A significant percentage (68%) of respondents were unable to identify how the disease spreads. This indicates a concerning level of misinformation, especially considering that the exposure to RVF through preventable routes is high. Moreover, 73% of respondents lacked knowledge about the seasonality of RVF, further impeding the community's ability to implement appropriate preventive measures at the right times. Comparable results have been observed in studies from Kenya,[15] Uganda,[16] Malawi,[17] and Tanzania,[18] which demonstrated insufficient knowledge about RVF. In a study among pastoralists in northeastern Kenya, despite 80% of individuals having heard of RVF, only 11% recognized abortion as a symptom in livestock.[15]

Research in Tanzania similarly indicated a poor understanding of RVF, especially among agro-pastoral communities, recommending regular health education to improve awareness and prevention practices.[18] A study in Malawi found alarmingly low levels of RVF knowledge, with only 17.94% of livestock farmers aware of the disease, calling for heightened community sensitization.[17]

Our research revealed that merely 15% of respondents had a university-level education, likely influenced by local and financial factors. According to other research, higher levels of education are linked to greater knowledge and attitudes toward RVF.[15,19]

The observed behaviors in this study, including the high percentage (86%) of households slaughtering animals on their premises with inadequate waste disposal, coordinate with reports from other regions. For instance, a study in Kenya reported that individuals often slaughter sick animals outside of the official system, sometimes using fake or corrupt stamps of approval on their meat. This practice was driven by the significant financial loss to the owner of the animal.[20] These traditions have a strong historical foundation in cultural and economic contexts, indicating that public health measures need to be culturally sensitive. For example, in Somalia, traditional sacrificial practices involve slaughtering animals, which increases the risk of RVF infection.[21] Therefore, tackling health dangers linked to RVF requires a comprehensive understanding of local customs and economic pressures to develop effective and culturally appropriate public health strategies.

Our study identified a positive attitude toward managing RVF in 57% of respondents, which reflects a willingness to address the disease effectively. However, this positive outlook is contrasted by a significant lack of awareness, as 51% of respondents did not know the proper actions to take if RVF cases occurred nearby. Similarly, 45%

of respondents were unaware of the isolation measures required during an outbreak, indicating gaps in knowledge that could hinder effective response efforts.

In comparison, a study conducted in Kenya reported that 86% of respondents were aware of the threat posed by RVF outbreaks and knew the appropriate actions to take, highlighting a higher level of preparedness in that population.[15] This discrepancy underscores the importance of targeted educational initiatives to bridge the knowledge gap and enhance community preparedness. Addressing these shortcomings is essential to mitigate delays in outbreak detection and containment, thereby reducing the severity and spread of RVF.

On a positive note, our study recorded good food safety practices, with 92% of respondents avoiding raw meat and 93% avoiding raw milk, behaviors that reduce the risk of RVF transmission.[22]

The distribution of perceived responsibility for RVF management (18% to health authorities, 4% to veterinary authorities, and 11% to the community level), This highlights the necessity for improved collaboration between these groups, especially in regions where livestock are crucial to the economy. The low level of responsibility attributed to veterinary authorities is particularly concerning, as livestock health serves an essential function in controlling RVF.

Our study's Knowledge, Attitude, and Practice (KAP) scores revealed significant gaps. Only 3% of respondents demonstrated adequate knowledge of RVF, 57% maintained a positive attitude regarding disease management, and 61% displayed poor practices regarding prevention and control. These findings align with a study conducted among communities that rely on pastoralism in Kenya, where, despite all participants had heard about RVF, there were notable deficiencies in knowledge and preventive practices.[23]

Variations between genders were also apparent in this study. Females showed significantly better knowledge of key aspects such as RVF etiology, transmission routes, symptoms, and medical testing. For instance, 23% of females knew about the causes of RVF, compared to 8.4% of males, and 92.3% of females understood the medical testing requirements, versus 56.2% of males. Additionally, females had a more optimistic attitude on pursuing medical care and treatment, with 90% displaying good attitudes towards medical care, compared to 77% of males. However, males demonstrated better practical implementation of measures such as handling dead animals and waste disposal, with 48% of males practicing proper handling of dead animals compared to 23% of females. These gender differences highlight the need for gender-targeted health education interventions. However; a study in Tanzania showed males possessed greater knowledge than females,[18] and a study in Kenya showed no gender difference in knowledge.[15]

Current RVF prevention efforts in Sudan, including vector control, health education, and monitoring, have shown some success. For instance, vector control through household inspections and insecticide spraying has reduced mosquito populations.[24] However, challenges remain, such as poor health infrastructure, delays in responses, and the risk of transmission through needle pricks during vaccinations, which limit prevention options.[25]

Historical data also show significant delays between the initial alerts and confirmation of human cases, which hampers effective preventive measures.[26] Heavy rains and flooding create ideal conditions for mosquito breeding, complicating efforts to control RVF transmission.[27] Despite vector control efforts, these actions might not be enough given the scale of outbreaks and environmental conditions. Sudan's ongoing economic crisis further hampers public health interventions and exacerbates the economic impact of RVF outbreaks, particularly on livestock-dependent livelihoods.[27,28]

Key recommendations to improve RVF control include integrating human and animal health services, increasing community involvement in surveillance and control efforts, implementing culturally sensitive interventions, and investing in health education and infrastructure. Further research is necessary to assess the effectiveness of interventions, address economic barriers, and develop sustainable surveillance systems.

With the right resources and political will, these challenges can be overcome, reducing the global burden of RVF.

In conclusion, this KAP study reveals critical gaps in knowledge, attitudes, and practices related to RVF. Without widespread intervention, the risk of future outbreaks remains high. However, targeted community engagement, improved surveillance, and health education can significantly enhance awareness and preventive practices, contributing to better management and control of RVF in Sudan and beyond.

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References

1. Daubney R, Hudson JR. RIFT VALLEY FEVER. The Lancet 1932;219(5664): 611–2.
2. Infectious Diseases of Livestock, 2nd Edition| VetBooks.
3. Walter CT and Barr JN. Recent advances in the molecular and cellular biology of bunyaviruses. J Gen Virol 2011;92(Pt 11): 2467–84.
4. McMillen CM and Hartman AL. Rift Valley fever in animals and humans: Current perspectives. Antiviral Res 2018; 156: 29–37.
5. Ahmed A, Makame J, Robert F, Julius K, and Mecky M. Sero-prevalence and spatial distribution of Rift Valley fever infection among agro-pastoral and pastoral communities during Interepidemic period in the Serengeti ecosystem, northern Tanzania. BMC Infect Dis 2018;18(1): 1–8.
6. Girard M, Nelson CB, Picot V and Gubler DJ. Arboviruses: A global public health threat. Vaccine 2020;38(24): 3989–94.
7. Edward M, Heniedy AM, Saminu A, Florence Mary JJ, Ahmed DA, Engmann ST, Onyeaghala C and Shah S. Climate change and contagion: the emerging threat of zoonotic diseases in Africa. Infect Ecol Epidemiol 2025;15(1): 2441534.
8. Hassan OA, Ahlm C, Sang R and Evander M. The 2007 Rift Valley fever outbreak in Sudan. PLoS Negl Trop Dis 2011;5(9): e1229.
9. Lapa D, Pauciullo S, Ricci I, Garbuglia AR, Maggi F, Scicluna MT and Tofani S. Rift Valley Fever Virus: An Overview of the Current Status of Diagnostics. Biomedicines 2024 ;12(3): 540.
10. Hassan OA, Affognon H, Rocklöv J, Mburu P, Sang R, Ahlm C and Evander M. The One Health approach to identify knowledge, attitudes and practices that affect community involvement in the control of Rift Valley fever outbreaks. PLoS Negl Trop Dis 2017;11(2): e0005383.
11. Peyre M, Chevalier V, Abdo-Salem S, Velthuis A, Antoine-Moussiaux N, Thiry E and Roger F. A Systematic Scoping Study of the Socio-Economic Impact of Rift Valley Fever: Research Gaps and Needs. Zoonoses Public Health 2014;62(5): 309–25.
12. Ahmed A, Dietrich I, Desiree LaBeaud A, Lindsay SW, Musa A and Weaver SC. Risks and Challenges of Arboviral Diseases in Sudan: The Urgent Need for Actions. Viruses 2020;12(1): 81.
13. Ahmed A, Ali Y, Elduma A, Eldigail MH, Mhmoud RA, Mohamed NS, Ksiazek TG, Dietrich I and Weaver SC. Unique Outbreak of Rift Valley Fever in Sudan, 2019. Emerg Infect Dis 2020;26(12): 3030.
14. Métras R, Collins LM, White RG, Alonso S, Chevalier V, Thuranira-McKeever C and Pfeiffer DU. Rift Valley Fever Epidemiology, Surveillance, and Control: What Have Models Contributed? Vector Borne Zoonotic Dis 2011;11(6): 761-71.
15. Chiuya T, Fevre EM, Junglen S and Borgemeister C. Understanding knowledge, attitude and perception of Rift Valley fever in Baringo South, Kenya: A cross-sectional study. PLOS global public health 2023;3(9): e0002195.
16. de St Maurice A, Nyakarahuka L, Purpura L, Ervin E, Tumusiime A, Balinandi S, Kyondo J, Mulei S, Tusiime P, Manning C, Rollin PE, Knust B and Shoemaker. Rift Valley Fever: A survey of knowledge, attitudes, and practice of slaughterhouse workers and community members in Kabale District, Uganda. PLoS Negl Trop Dis 2018;12(3): e0006175.
17. Kainga H, Mponela J, Basikolo L, Phonera MC, Mpundu P, Munyeme M, Simulundu E and Saasa N. Assessment of Knowledge, Attitudes, and Practices towards Rift Valley Fever among Livestock Farmers in Selected Districts of Malawi. Trop Med Infect Dis 2022;7(8): 167.
18. Issae AR, Katakweba AAS, Kicheleri RP, Chengula AA and Kasanga CJ. Knowledge, attitudes and practices on rift valley fever among pastoral and agropastoral communities of Ngorongoro in the rift valley ecosystem, Tanzania, conducted in 2021/2022. PLoS Negl Trop Dis 2023;17(8): e0011560.
19. Odinoh R, Dawa J, Situma S, Nyakarahuka L, Lepore L, Vanlerberghe V, Nasimiyu C, Makiala S, Ifufa C, Mukadi D, Viala H, Owor N, Bakamutumaho B, Ndumu D, Masumu J, Breiman RF and Njenga K. Have you heard of Rift Valley fever? Findings from a multi-country study in East and Central Africa. medRxiv 2024;2024.12.02.24318288.
20. Gerken KN, Maluni J, Mutuku FM, Ndenga BA, Mwashee L, Ichura C, Shaita K, Mwaniki M, Orwa S, Seetah K and LaBeaud AD. Exploring potential risk pathways

with high risk groups for urban Rift Valley fever virus introduction, transmission, and persistence in two urban centers of Kenya. PLoS Negl Trop Dis 2023;17(1): e0010460.
21. Muga GO, Onyango-Ouma W, Sang R and Affognon H. Indigenous knowledge of Rift Valley Fever among Somali nomadic pastoralists and its implications on public health delivery approaches in Ijara sub-County, North Eastern Kenya. PLoS Negl Trop Dis;15(2): e0009166.
22. Grossi-Soyster EN, Lee J, King CH and LaBeaud AD. The influence of raw milk exposures on Rift Valley fever virus transmission. PLoS Negl Trop Dis 2019;13(3): e0007258.
23. Abdi IH, Affognon HD, Wanjoya AK, Onyango-Ouma W and Sang R. Knowledge, Attitudes and Practices (KAP) on Rift Valley Fever among Pastoralist Communities of Ijara District, North Eastern Kenya. PLoS Negl Trop Dis 2015;9(11): e0004239.
24. Rift Valley Fever – Republic of the Sudan. WHO 2019.
25. Himeidan Y. Rift Valley fever: current challenges and future prospects. Res Rep Trop Med 2016;7: 1-9.
26. Osman S, Taha A, Osama R, AlKhidir A, Abdallah R. Outbreak of Rift Valley Fever, River Nile State, Sudan-2019: A Teaching Case-Study. Pan African Medical Journal 2020;36(1):15.
27. Aradaib IE, Erickson BR, Elageb RM, Khristova ML, Carroll SA, Elkhidir IM, Karsany ME, Karrar AE, Elbashir MI and Nichol ST. Rift Valley Fever, Sudan, 2007 and 2010. Emerg Infect Dis 2013 [cited 2024 Dec 20];19(2):246-53.
28. Activists: 'Rift Valley Fever epidemic' in Sudan's Northern State - Sudan | ReliefWeb