RESEARCH ARTICLE

Shqipe Kola Krasniqi [1]
Hajrullah Fejza [2]
Fitim Alidema [2]

Assessment of knowledge, attitudes and practices regarding hemorrhagic fever with renal syndrome among temporary residents in mountains

Authors' addresses:
[1] Regional Center for Public Health, Peja, Kosovo, Albania
[2] University for Busiess and Technology, Prishtina, Albania

Correspondence:
Hajrullah Fejza
University for Busiess and Technology, Prishtina, Albania
e-mail: hajrullah.fejza@ubt-uni.net

Article info:
Received: 11 November 2024
Accepted: 31 July 2025

ABSTRACT

Background: Hemorrhagic fever with renal syndrome is a group of acute infectious diseases caused by Hantaviruses. In Kosovo the natural foci of the disease are some of the mountains. The aim of the study was to assess the knowledge of the temporary residents who own small houses in the mountains and are exposed to contact with rodents, the route of transmission, and the assessment of attitudes and practices.

Methods: The quantitative method with a cross-sectional model was used for the study. 204 participants from the municipalities of Deçan, Istog, and Junik who have small houses in the mountains were interviewed face to face with a standardized questionnaire. Descriptive and analytical statistics with 95% significance and a p-value of 0.05 were used to explain the responses of the participants.

Results: 192 respondents have heard about hemorrhagic fever with renal syndrome, and 164 have knowledge that the disease is very serious, but only 49 consider it very serious in the place where they live. The most known symptoms are fever and flu-like symptoms (40.0%). The main known route of transmission of the disease is contact with rodents (49 %), and the rodent control is the main preventive measure (43.6%). 115 have learned about the disease from relatives and friends, and 54.9 % have had contact with the rodents during the previous season.

Conclusion: This study highlights the lack of knowledge and attitudes of residents, which consequently has an impact on the lack of practices related to the prevention of the disease.

Key words: hemorrhagic fever, renal syndrome, hantaviruses, rodents, mountains

Introduction

Hemorrhagic fever with renal syndrome (HFRS) is a group of acute infectious diseases caused by Hantaviruses of the Bunyaviridae family. HFRS includes diseases such as Korean hemorrhagic fever, epidemic hemorrhagic fever, and endemic nephropathy (CDC, 2017).

In Europe in 2019, 29 countries reported 4046 cases of hantavirus infections (0.8 cases per 100,000 population), with Finland and Germany accounting for 69% of all reported cases (ECDC, 2021).

HFRS is endemic in the Balkans, with epidemic outbreaks and sporadic cases recorded every year since the disease was first recorded. The incidence of the disease is modest, approximately 100 cases per year, but as a result of infection with Dobrava virus (DOBV), mortality can be high (on average 12%) (Avšič & Korka, 2014).

Although not limited to temporary residents, the 2009 survey focused on mountainous Herzegovina, where 300 exposed individuals (versus 100 control teachers) were tested. Results showed 5% seroprevalence in the exposed group (vs. 1% in controls). The study also confirmed circulating Puumala and Dobrava viruses, with higher antibody prevalence among men and residents of mountainous areas (Nikolić et al., 2009).

This case–control study investigated a major HFRS outbreak in Zagreb related to Mount Medvednica. Comparing 104 cases with matched controls, the study identified strong associations between infection and activities typical of temporary mountain residents—such as visiting forested areas, observing rodents, cycling, picking flowers, and drinking spring water—highlighting key knowledge, attitudes, and practices in a mountain setting (Lovrić et al., 2018).

The first cases in Kosovo were registered in 1986, when 36 cases were verified in the laboratory. Since then, the disease has been constantly present either in sporadic or epidemic

http://www.jbb.uni-plovdiv.bg DOI: 10.69085/jbb20252081

form. Research has shown that in Kosovo the natural foci of the disease are the mountains of Peja, Deçan, Junik, Istog, Gjakova, and Ferizaj (Dedushaj & Humolli, 2005).

Until now, there has been no specific treatment for hantavirus disease. Early treatment of HFRS patients with ribavirin can reduce the severity of symptoms. Because hantaviruses in Europe do not spread from person to person, there is no need for isolation. There is no hantavirus vaccine licensed in Europe. From 1999 to 2022, 41 cases of HFRS have been reported in the Peja Region, including 5 deaths. These cases are mainly from the municipality of Deçan, Istog, and Junik. In the mountains of these municipalities, people have small houses or stables and live there temporarily on a seasonal basis from May to September.

Sudi et al. (2018) emphasizes that adequate knowledge about hantavirus infection by health personnel and community members plays an important role in the prevention and control of virus transmission between rodents as hosts of the virus and human beings. The study assessed that there is a gap in knowledge, attitudes, and practices on hantavirus infection that affects public health in terms of proper case management and disease control.

The objectives of the study were to assess the knowledge of temporary residents in the mountains regarding HFRS, disease symptoms, transmission routes, and preventive measures; evaluate attitudes that may contribute to the transmission of hantaviruses from the reservoir to humans; and evaluate practices that may expose humans to hantaviruses.

Materials and Methods

The quantitative method with a cross-sectional model was used for the study. 204 participants from the municipalities of Deçan, Istog, and Junik who have small houses in the mountains were interviewed face to face with a standardized questionnaire. Descriptive and analytical statistics with 95% significance and a p-value of 0.05 were used to explain the responses of the participants.

Verbal consent for participation in the study was requested from the person chosen for the interview. The data to determine the number of families that own houses and stables were obtained from household registers. From these sources, 430 registered families were identified, from which a sample of 204 was selected with a confidence level of 95% with the formula calculated in the OpenEpi software. The selection of the random sample was made in Microsoft Excel with the Rand formula, where, after the generation of random numbers, filtering was done according to municipalities and mountains. The 204 families for interview were chosen according to the proportion of municipalities in the population of 430 families.

The data collection was done using a standardized questionnaire with 33 closed questions that included (4 questions about socio-demographic data and 4 questions related to the frequency of going to the mountain, the length of stay), knowledge (8 questions), attitudes (5 questions), and practices (12 questions) regarding HFRS.

Data from the questionnaire were transferred to the database in Microsoft Excel, then cleaned, coded, and analyzed using STATA software, version 15. Descriptive analysis: continuous variables were reported with mean and standard deviation, while categorical variables were reported with number(n) and proportions (%).

Associations between explanatory variables as well as between explanatory variables and responses (knowledge, attitudes, and practices) were tested using Chi-square (X^2) and Fisher's exact test. An Independent Samples t-test was used to calculate the average of knowledge, attitudes, and practices related to socio-demographic factors. All these tests have a significance level p-value below 0.05 and a confidence interval of 95%.

Implementation activities have been developed for 6 months. Data collection was done in the period of May-June 2023.

Results

In this research, 204 residents who frequent the mountains of Deçan (166 or 81.4%), Istog (25 or 12.2%), and Junik (13 or 6.4%) were surveyed. Of the 204 residents surveyed, 52.0% were male and 48.0% female. As for the level of education, 43.6% have completed primary education, and 39.2% have completed secondary education. Of the respondents, 18.1% are employed, and 81.9% are unemployed. 97.6% respondents go to the mountains every year, and this phenomenon does not differ between municipalities, but there is a difference in terms of the length of stay in the mountains (p value 0.000). As for the reason for going to the mountains, there is a significant difference between the municipalities (p value 0.000) because while in the municipality of Deçan, 66.2% have a reason for going to the mountains for recreation, in the municipality of Istog, it is the matter of work and the care of livestock, 80% (Table 1).

Of all respondents, 94.1% have heard about HFRS, but there is a significant difference between the municipalities (p-value 0.000) because in the municipality of Istog, 36.0% have not heard at all. The most popular symptoms for respondents are fever 55.4%, flu-like symptoms 40.2% then pain and vomiting 11.8%), while other symptoms are much less popular, and 38.7% do not know all of what the symptoms of the disease are.

http://www.jbb.uni-plovdiv.bg DOI: 10.69085/jbb20252081

RESEARCH ARTICLE

Table 1. *Socio-demographic data of respondents by the municipalities (N=204).*

Variable	Deçan n (%)	Istog n (%)	Junik n (%)	Total n (%)	P value
Age group					
18-34	37(18.1)	7(3.4)	0(0.0)	44(21.6)	0.124
35-50	48(23.5)	5(2.5)	8(3.9)	61(29.9)	
51-67	56(27.5)	11(5.4)	4(2.0)	71(34.8)	
68 +	25(12.3)	2(1.0)	1(0.5)	28(13.7)	
Sex					
M	82(40.2)	16(7.8)	8(3.9)	106(52.0)	0.306
F	84(41.2)	9(4.4)	5(2.5)	98(48.0)	
Education level					
Elementary	73(35.8)	11(5.4)	6(2.9)	90(44.1)	0.861
Secondary	65(31.9)	11(5.4)	4(2.0)	80(39.2)	
University	28(13.8)	3(1.5)	3(1.5)	34(16.7)	
Employment					
No	136(66.7)	23(11.3)	8(3.9)	167(81.9)	0.074
Yes	30(14.7)	2(1.0)	5(2.5)	37(18.1)	
Frequency of visits					
Once a year	161(78.9)	25(12.25)	13(6.4)	199(97.5)	1.000
Once in two years	2(1.0)	0(0.0)	0(0.0)	2(1.0)	
Once in five years	3(1.5)	0(0.0)	0(0.0)	3(1.5)	
Duration of stay					
Less than one week	25(12.3)	2(1.0)	2(1.0)	29(14.2)	0.000
Up to one month	61(29.9)	0(0.0)	3(1.5)	64(31.4)	
Two months	37(18.1)	3(1.5)	6(2.9)	46(22.6)	
Three months	33(16.2)	4(2.0)	2(1.0)	39(19.1)	
The whole season	10(4.9)	16(7.9)	0(0.0)	26(12.7)	
The reason for staying					
Recreation	110(53.9)	4(2.0)	7(3.4)	121(59.1)	0.000
Health issues	5(2.5)	0(0.0)	0(0.0)	5(2.4)	
Work issues	51(25.0)	21(10.3)	6(2.9)	77(37)	

Pearson Chi2 and Fisher's exact test were used, with significance p-values of 0.05

Regarding the transmission routes of HFRS, 49.0% of respondents are aware that HFRS is transmitted through contact with rodents, 23.0% eating unwashed fruit, and 19.1% eating contaminated food, while 34.3% do not know how the disease is transmitted.

Of the 204 residents surveyed, 36.8% are afraid that they might get sick from HFRS, while 63.2% are not afraid at all, and if they were to get sick with HFRS, 77.0% of them would talk to their family first, while 21.6% to the doctor or health personnel.

As for practices related to HFRS, 54.9% of respondents had contact with rodents during the past season outside the home, 28.9% while working in the forest, and 22.1% inside the home. 58.8% respondents affirmed that they have holes or cracks in their houses where rodents can penetrate. 45.1% never use gloves and masks when cleaning the stalls, while 11.8% do not take measures at all against raising dust while cleaning the stalls, and also do not use bleach if they notice areas with signs of rodents.

The answers to these questions were coded, and then the scores were aggregated, and the mean and standard deviation were calculated. Thus, for knowledge, the range of points is from 0-15, and the calculated mean value is 8.0 with SD 3.37. For attitudes, the range of points is 0-6 with a calculated average value of 3.5 and SD 1.65, while for practices, the range is 0-33 with an average value of 15.6 and SD 2.93. From the obtained points, the degree of knowledge, attitudes, and practices was determined using Bloom's modified cutoff, where the values of points 0-59% for knowledge, attitudes, and practices were defined as weak/deficient degrees and the values of points 60-100 % as good degrees (Table 2).

Table 2. *Scores and scale of knowledge, attitudes, and practices related to HFRS*

Variable	Range	Mean	SD	Ratio %
Knowledge's	0-15	8.0	3.37	Poor=0-59
Attitudes	0-6	3.5	1.65	Good=60-100
Practices	0-33	15.6	2.93	Poor=0-59

Then the correlation between the points of knowledge, attitudes and practices was calculated, where between the points of knowledge and attitudes the correlation is moderately positive and significant (p = 0.000), between knowledge and

http://www.jbb.uni-plovdiv.bg DOI: 10.69085/jbb20252081

practices there is a weak but significant positive correlation (p = 0.0255), whereas between attitudes and practices, there is a slight positive and significant correlation (p = 0.0008), (Table 3).

Table 3. *Correlation between knowledge scores, attitudes, and practices related to HFRS.*

	Knowledge's	Attitudes	Practice
Knowledge's	1.0000		
Attitudes	0.3423 p=0.0000	1.0000	
Practice	0.1564 p=0.0255	0.2333 p=0.0008	1.0000

Spearman correlation with p-significant value was used at

Based on this classification, binary variables were created for univariate binary logistic regression. Regarding the level of knowledge, 66.2% have poor knowledge compared to 33.8% who have good knowledge, and this represents a significant difference (p = 0.000 and CI 95% 0.272-0.403). In the degree of attitudes, positive attitudes dominate (p = 0.007 and CI 95% 0.525-0.661) because 59.3% have good attitudes compared to 40.7% who have a poor degree of attitudes. Only 10.8% have good practices, while 89.2% have poor practices (p = 0.000 and CI 95% 0.649-0.1507). (Table 4).

Table 4. *Frequency, Mean, and Standard Deviation of the scale of knowledge, attitudes, and practices related to HFRS.*

	Variable	N (%)	Mean	SD	CI 95%	P value
Knowledge ratio	Poor (0-59%)	135(66.2)	0.34	0.03	0.272-0.403	0.000
	Good (60-100%)	69(33.8)				
Attitudes ratio	Poor (0-59%)	83(40.7)	0.59	0.49	0.525-0.661	0.007
	Good (60-100%)	121(59.3)				
Practices ratio	Poor (0-59%)	182(89.2)	0.11	0.31	0.649-0.152	0.000
	Good (60-100%)	22(10.8)				

One-sample t-test with p-value 0.05 and interval të confidence 95% was used.

Discussion

Few studies have been conducted regarding the knowledge, attitudes, and practices related to hantaviruses, especially in Europe. On the other hand, without reliable and effective vaccines and with limited treatment options, non-pharmaceutical interventions, including standard hygienic practices that focus on the control of rodents as carriers of infection, are the cornerstone of preventive interventions (Riccò et al., 2021). Greater knowledge of the pathogen and Hantavirus disease is associated with reduced disease burden in Europe (Sudi et al., 2018).

Of the 204 respondents, 94.1% have heard of HFRS, which is a higher percentage than in the study of Harris & Armién (2020), where 86% of respondents have heard of the disease, although the comparison of these studies is difficult due to geographical differences.

The two most popular symptoms are fever and flu-like symptoms (55.4% and 40.0%), but it turns out that 38.7% do not recognize any symptoms of the disease. Recognizing the symptoms of the disease is of particular importance because most hantavirus infections result in mild disorders and only a small proportion of cases develop characteristic clinical features that can lead to the final diagnosis (Riccò et al., 2021).

Regarding practices, the most frequent contact with rodents is outside the house and during work in the forest, but 22.1% had contact inside the house, and 12.8% in the warehouse. Also, 58.9% have holes or cracks in the walls of the house where rodents can penetrate, and this may also be related to the socio-economic conditions of the residents, which were also mentioned in the works of Sudi et al. (2018), but in this research, the socio-economic conditions have not been elaborated.

As a conclusion, this study has shown that the surveyed residents who frequent the mountains have a gap in knowledge, attitudes, and therefore in practices related to HFRS. Since the degree of knowledge is associated with practices then it is plausible that filling such knowledge gaps can improve practices and infection prevention.

In this research, the results suggest that future campaigns should target those with lower levels of education. It is also important to take these results in a socio-economic context, because economic constraints can make it difficult to purchase adequate furnishings in terms of maintaining hygiene, materials for closing holes and cracks in the stable, or even in the solid construction of the temporary houses.

Since there are many issues related to the disease that have not been researched, a multidisciplinary approach (One Health), including not only the human but also the environmental and animal sectors, is needed.

As a limitation of this research, we identified the fact that only the households that are registered in the relevant institutions are included, and those households that are not registered are not included. Also, residents who go to these mountains as guests or stay there on a daily basis are not included in the study due to difficulties in identifying and reaching them. Therefore, this research can be considered as a pilot study due to the influence of the knowledge, attitudes, and practices of these residents that cannot be reached in the results of the study.

Acknowledgements

No private or corporate funding was obtained for this work. No conflict of interest at all.

References

Avšič Županc T, Korva M, Markotić A. 2014. HFRS and hantaviruses in the Balkans/South-East Europe. Virus Res., 187: 27-33. doi:10.1016/j.virusres.2013.12.042

CDC: Hemorrhagic fever with renal syndrome. https://www.cdc.gov/hantavirus/hfrs/index.html

Dedushaj I, Humolli I. 2005. Epidemiologjia speciale e sëmundjeve ngjitëse, Universiteti i Prishtinës, Kosovë

ECDC (2021). Hantavirus infection - Annual epidemiological report for 2019. Stockholm: ECDC. Annual epidemiological report for 2019

Harris C, Armién B. 2020. Sociocultural determinants of adoption of preventive practices for hantavirus: A knowledge, attitudes, and practices survey in Tonosí, Panama. PLoS Negl Trop Dis, 14(2): e0008111.

Lovrić Z, Kolarić B, Kosanović Ličina ML, Tomljenović M, Đaković Rode O, Danis K, Kaić B, Tešić, V. 2018. An outbreak of hemorrhagic fever with renal syndrome linked with mountain recreational activities in Zagreb, Croatia, 2017. Epidemiology and Infection, 146(10): 1236–1239.

Nikolić J, Kuzman I, Markotić A, Rode OD, Curić I, Ivanković HB, Grgić S. 2009. The occurrence of hemorrhagic fever with renal syndrome in southern parts of Bosnia and Herzegovina. Collegium antropologicum, 33(2): 37-42.

Riccò M, Ferraro PB, Ranzieri S. 2021. Hantaviruses in agricultural and forestry workers: Knowledge, attitudes and practices in Italian physicians. Trop. Med. Infect. Dis., 6(3): 169.

Sudi L, Olomi1 W, Mangu1 C, Tarimo M, Ntinginya1 N, Shirima G. 2018. Assessment of knowledge, attitude and practices (KAP) on hantavirus infections at community level in Mbeya Region, Tanzania. J Trop Dis, 7: 1, DOI: 10.4172/2329-891X.1000290