



# A Hydric Outbreak in a Municipal Drinking – Water Supply in Kruja, Albania

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## Abstract

**BACKGROUND:** Contaminated drinking water causes extensive outbreaks of illness because of the large number of people served by water supply facility.

**AIM:** The present study describes a community epidemic outbreak of infection with multiple pathogens in Kruja city, Albania, in October 2021.

**METHODS:** This descriptive study presents a case of epidemic outbreak caused by the hydric system in the inhabitants of the Kruja city from October 23, 2021 to October 29, 2021. A standard questionnaire was used for interview that addressed clinical symptoms, food consumption, and environmental exposures. Clinical specimens were cultured using standard microbiological methods for bacterial and viral pathogens. During 6 days of epidemy, 690 patients were treated to the emergency room of Kruje hospital.

**RESULTS:** Day 3 presented the highest number of patients 39.1% (270/690) and the last day of epidemy presented the lowest number of patients 1.4% (10/690). Abdominal pain continuing with vomiting was more frequently clinical sign among patients. The most affected age group is 15–44 years old, which is also the most active age group. Salmonella Gr. B and Norovirus G2 were the results taken from the examination of stool samples. Analysis of a water sample resulted in Enterococcus faecalis contamination.

**CONCLUSION:** Problems with drinking water are still present in our country. The latest outbreak shows the special care and importance of safe storage and distribution of drinking water. Investments in water supply as well as rigorous monitoring of drinking water should be an absolute priority of both public health and local government employees.

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## Introduction

Drinking water outbreaks occur worldwide and may be caused by several factors, including raw water contamination, treatment deficiencies, and distribution network failure [1]. Consumption of contaminated water supplies is associated with the largest proportion of cases of water-related infectious disease. Contamination of water supplies with human and animal feces can lead to the introduction of a variety of pathogens into the supply. This can occur at any stage of drinking-water abstraction, treatment, distribution, or at the point of use [2], [3], [4]. Waterborne diseases caused by the consumption of contaminated water can affect a large number of people in a short time, and the pathogens can cause both acute and chronic health effects [5], [6].

The World Health Organization guidelines for drinking-water quality [7] provide detailed information on some of the most common pathogens that can be transmitted through drinking water. The detection of such outbreaks requires the identification of an increase in illness (usually the rate of gastrointestinal disease) in the exposed population and confirmation that water was the route of transmission [8]. However,

in routine practice, it is not easy to detect an increase in clinical cases and to link this increase to waterborne transmission; thus, waterborne outbreaks are often unrecognized and underestimated [9].

Distribution system failures cause outbreaks, primarily of waterborne enteric pathogens. In general, an outbreak is likely to be attributed to some pathogens as the etiological agents; however, *Escherichia coli*, *Campylobacter*, *Norovirus*, etc., are occasionally involved in a waterborne outbreak and also are the pathogens identified most frequently worldwide [10], [11]. Microbiological examination of water is more complex than the examination of stools, and there is often a failure to detect pathogens in water [5]. The present study describes a community epidemic outbreak of infection with multiple pathogens in Kruja city, Albania, in October 2021.

## Methods

The following article is a descriptive study that presents a case of epidemic outbreak cause from the hydric system in the inhabitants of the Kruja city from

October 23, 2021 to October 29, 2021. On October 25, 2021 (10:00 am.) became the first announcement by Kruja Local Health Care Unit at the Institute of Public Health for the unusual increase in the number of cases of patients with gastrointestinal problems in the emergency room of Kruje hospital, comparing them with October 23, 2021, and onward, as well as comparing them with the same period of the previous year. Patients have been diagnosed in the Kruja hospital emergency for gastroenteritis or food intoxication.

### Measures taken

1. At 10:00 am on October 25, 2021, the supply of drinking water to the city of Kruja was closed, notices were placed for non-consumption of water remaining in personal and joint deposits for an indefinite period until the situation is fully clarified.
2. Water samples were taken in all lines and branches of the city as well as in its main deposit.
3. Stool samples were taken from the Local Health Care Unit KRUJE (8 samples) and were sent to the laboratory of Enterobacteriaceae, Institute of Public Health (IPH).
4. The situation in KRUJE is being monitored

dynamically by the Local Health Care Unit until its resolution. Figure 1 shows the distribution of cases in all neighborhoods of the city.

### Risk factor analysis

During the interviews of the patients based on a standard questionnaire, a number of risks and food-related factors were assessed where no common foods were found. A common factor was water.

### Microbiological examination

Patients presented with gastrointestinal problems in the Emergency Department of Kruja Hospital were taken samples of:

Coproculture (with rectal swabs) from Local Health Care Unit Kruje for the "Laboratory of Enterobacteriaceae" IPH, which have come to IPH on October 25, 2021, 1:00 pm. A total of eight rectal swabs were taken.

Coproculture (with rectal swabs) from IPH for "Laboratory of Enterobacteriaceae." A total of 10 rectal swabs were taken on October 25, 2021, at 8:00 pm.

Two stool samples for viral agents for the Laboratory of Virology, IPH, on October 25, 2021.

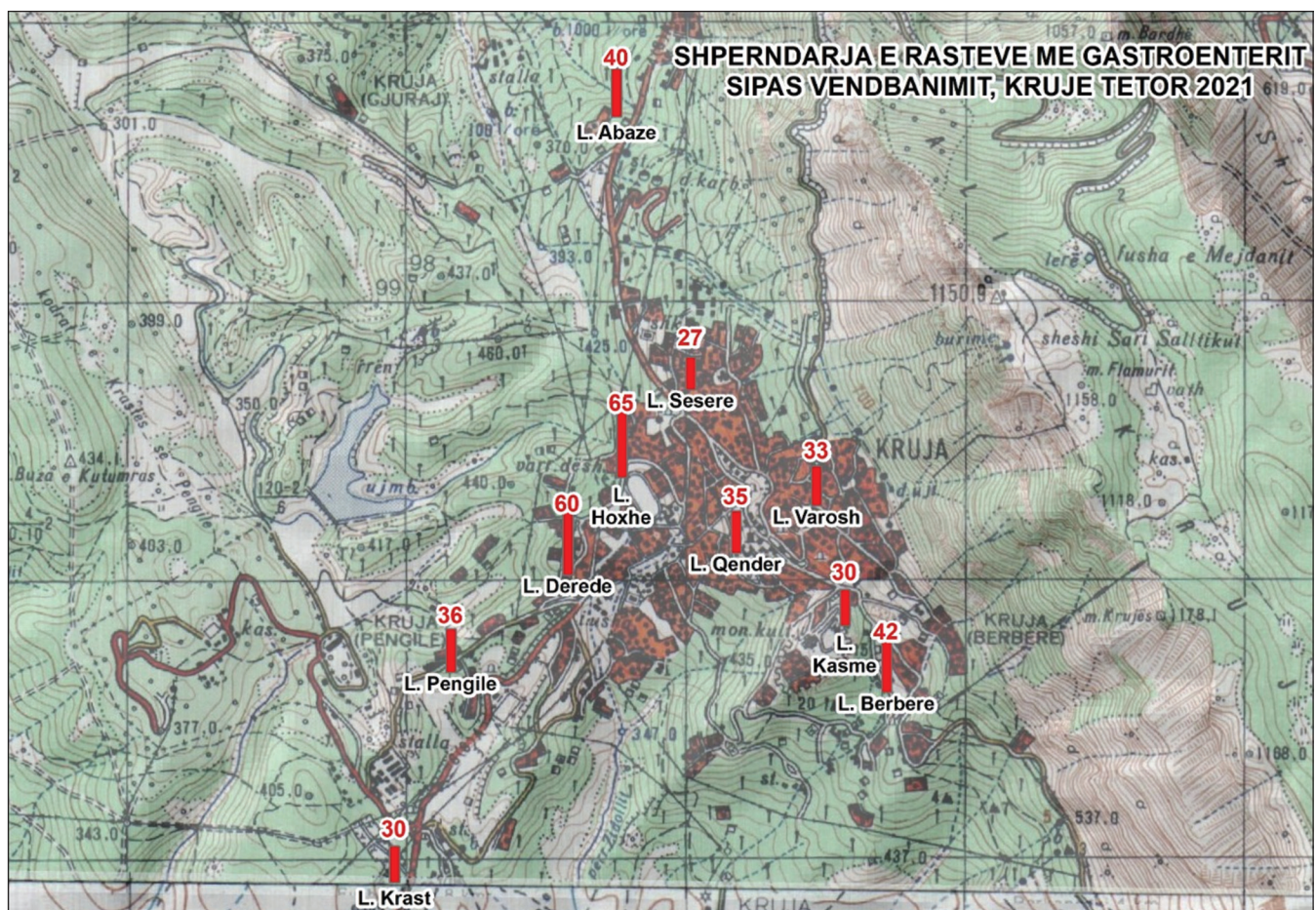


Figure 1: The distribution of cases in all neighborhoods of the city

Two patients who were hospitalized in the Toxicology Service, QSUT, took a rectal tampon on October 26, 2021 by IPH. Furthermore, from the IPH, a water sample were taken from the water supplies and were analyzed for the microbial contamination.

## Results

A total of 690 patients have required the treatment to the medical staff of the emergency room in Kruja Hospital. From the epidemiological investigation, the distribution of cases with gastrointestinal problems presented in the emergency room of Kruja Hospital, is presented in the following graph according to the respective days, where it is clear an increase of cases with gastroenteritis which started on Sunday at 8:00 am, increase that has continued until to date October 26, 2021 (1:00 pm.).

After that, we have a decrease of patients that required a treatment to the medical staff. Hence, the first day October 24, 2021, in the emergency room of Kruja Hospital are presented 45 patients for treatment, in day October 25, 2021, about 151 patients have hospitalized, and in day October 26, 2021, are presented the highest number of patients 270 in total.

After this day, a noticeable decrease is observed with the previous day were appearing only 159 patients in the emergency room on October 27, 2021 and arrived in 55 patients on October 27, 2021, and about 10 patients on October 29, 2021. After the patients have received their treatment, they are returned to the home. Some of them have returned again to the emergency room of Kruja Hospital but have not been hospitalized. Figure 2 shows the epidemic curve of treated patients during the days.

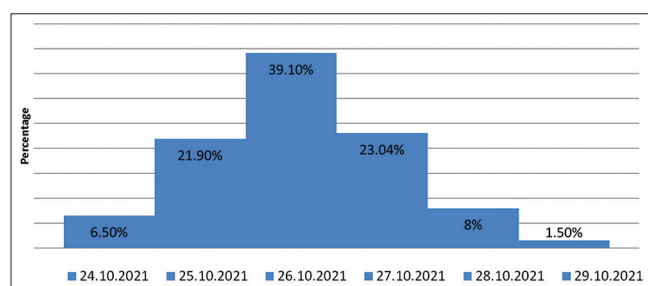


Figure 2: Epidemic curve of treated patients during the days

Regarding the clinical signs, abdominal pain continuing with vomiting was more frequently, sometimes, they referred to fever and to some other cases were present diarrhea. The fever is mainly observed at the age of 1 to 15 years, varying up to 39° or 40°. In the age group of 20 to 30 years, the fever varies from 37° to 38° (Table 1).

Table 1: Clinical spectrum of patients

Clinical signs	1–4 years		5–14 years		15–44 years		45–64 years		65+ years	
	N	%	N	%	N	%	N	%	N	%
Abdominal pain	25	3.6	100	14.5	194	28.1	51	7.4	28	4.0
Vomiting	25	3.6	85	12.3	126	18.3	12	1.7	9	1.3
Watery diarrhea	9	1.3	22	3.2	89	12.9	9	1.3	3	0.43
Fever	18	2.6	74	10.7	64	9.3	2	0.3	1	0.14

Others patients over 40 years old are presented without fever but with the abovementioned clinic. Diarrhea in all cases is watery and bloodless. No one was in critical condition, all patients who showed up in the emergency room received the necessary therapy and went to their home.

Related to the distribution of cases by age group, the most affected age group was 15–44 years old, which is also the most active age group. Figure 3 shows the distribution of cases according to the age groups.

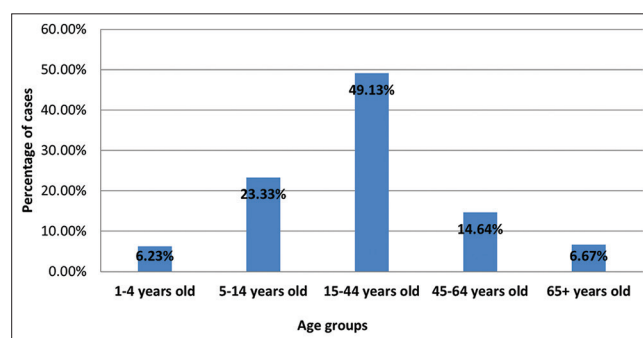


Figure 3: Distribution of cases according to the age groups

Regarding the microbiological examination, from patients presented with gastrointestinal problems in the Emergency Department of Kruje Hospital were taken samples of:

- Coproculture (with rectal swabs) from Local Health Care Unit Kruje for the “Laboratory of Enterobacteriaceae” IPH, which have come to IPH on October 25, 2021, 1:00 pm. A total of eight rectal swabs were taken. In the end, it resulted 4 – No increase and 4 – Negative.
- Coproculture (with rectal swabs) from IPH for “Laboratory of Enterobacteriaceae.” A total of 10 rectal swabs were taken on October 25, 2021, at 8:00 pm and resulted in 9 – Negative and in 1 Salmonella Gr.B. was isolated and identified.
- Two stool samples for viral agents for the Laboratory of Virology, IPH, on October 25, 2021. On October 27, 2021, from the examination of stool samples, it resulted that we were dealing with Norovirus G2.
- Two patients who were hospitalized in the Toxicology Service, QSUT, took a rectal tampon on October 26, 2021 by IPH and tested negative.

Meantime, the analysis of a water supplies sample was analyzed in the Institute of Public Health, and this sample results to be contaminated with *Enterococcus faecalis* (Table 2).

**Table 2: Microbial examination analyses in the institute of public health**

Microbial examination	Date of analysis	Number of samples taken	Negative	Positive
Coproculture (with rectal swabs)	October 25, 2021, 1:00 pm	8 rectal swabs samples	4 – Negative cases and 4 – No increase in cases	
Coproculture (with rectal swabs)	October 25, 2021, at 8:00 pm	10 rectal swabs samples	9 – Negative cases	1 Salmonella Gr.B
Serology stool samples for viral agents	October 25, 2021	2 stool samples		2 Norovirus G2
Coproculture (with rectal swabs)	October 26, 2021	2 rectal swabs samples	2 – Negative cases	

## Discussion

Significant sources of water pollution include human sewage and animal waste poured into water distribution systems and surface water [12]. The resulting fecal contamination of drinking water is a known route for the waterborne transmission of enteric pathogens; thus, the removal of biological and chemical contaminants from drinking water before human consumption is an essential step for securing water safety [13], [14].

The started day of this hydric epidemic outbreak in Kruja, Albania, was October 24, 2021. Overall, 690 patients presented to the emergency room in Kruja Hospital, and the hospitalization and treatment of them continued for almost 6 days, where the third day presented the highest number of patients 39.13% in total. The most affected age group in this study resulted 15–44 years old, which is also the most active age group among the population.

According to the clinical signs, abdominal pain and vomiting were the most frequent signs, but some of the cases referred to fever and diarrhea also. No one was in critical condition, all patients received the necessary therapy and went to their home.

In general, diseases caused by drinking water consumption are numerous and often dangerous both in terms of the clinic or the course and the intensity of the persons affected in time. Among the most common bacteria that are transmitted through water, we can mention the one that includes campylobacteria such as *E. Coli*, *Salmonella*, *Shigella*, etc., while those with viral origin, we can mention hepatitis A and E and Norovirus [15].

In this hydric epidemic outbreak, during the microbial examination from the stool of patients (coproculture with rectal swabs), was isolated and identified one patient with *Salmonella* Gr.B and one patient with Norovirus G2. The isolated strain, antimicrobial susceptibility testing, and serotyping were underway according to the protocol. The isolated and identified strain may be random due to the natural incidence of this pathogen and cannot be identified as the etiological cause of the situation. *E. faecalis* was the result from the water sample analysis.

## Conclusion

Problems with drinking water are still present in our country. The latest outbreak shows the special

care and importance of safe storage and distribution of drinking water. From October 20, 2021 to October 23, 2021, in the territory of our country, there was rain, which we believe was the cause of pollution of drinking water in the water supply of Kruja. In the analysis of feces and water supply, various microorganisms were obtained, which does not allow us to say with certainty that the health problems were caused by the consumption of drinking water, but we must keep in mind that the analysis of drinking water by the IPH was taken 24 h after the beginning of the first cases with gastrointestinal signs in the city of Kruja and again turned out to be contaminated. The interruption of the drinking water supply led to the interruption of clinical cases, which adds to our suspicions that we are dealing with a classic water epidemic and the shape of the epidemic curve best illustrates our finding. Investments in water supply as well as rigorous monitoring of drinking water should be an absolute priority of both public health and local government employees.

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