



# Investigating Factors Related to Hepatitis an Outbreak in Ismailia Village, Karun City, in 2019

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## ABSTRACT

HAV is the most common cause of viral hepatitis worldwide, infecting millions of people each year. The HAV is transmitted mainly from person to person through the feces of infected people in person-to-person contact or through contaminated food and water. There is a direct and close relationship between the prevalence of hepatitis A infection in each community and the health status, access to safe drinking water, and socio-economic status of those communities. **Materials and Methods:** In April 2017, two definite hepatitis A cases were reported by an infection prevention and control specialist at Sina Hospital, Karun County. A case-control study was performed to identify the risk factors for the disease. A questionnaire of possible risk factors for the disease was then prepared. Independent variables were water consumption from desalination plant No. 1 (Mr. Zubeidi), water consumption from desalination plant No. 2 (Mr. Zahiri), history of vegetable consumption, history of swimming in Karun River, history of contact with patients, travel history, gender, and age. The required data were collected and then imported into SPSS software. They were then analyzed through logistic regression. **Results:** The logistic regression analysis results showed a relationship between hepatitis A and water consumption from the desalination plant No. 1 (Mr. Zubeidi), adapted to other variables (p-value = 0.01 and OR: 11.6). Furthermore, there was a relationship between hepatitis A and water consumption from the desalination plant No. 2 (Mr. Zahiri), adapted to other variables (p-value = 0.00, OR: 0.03). **Conclusion:** Patients with hepatitis A bought drinking water from Mr. Zubeidi desalination plant 11.6 times the healthy people. Our study also showed a significant difference and a negative relationship between drinking water consumption from desalination plant No. 2 (Mr. Zahiri) and the hepatitis A outbreak in Ismailia.

**Key Words:** Outbreak, Hepatitis A, Ismailia.

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## INTRODUCTION

The HAV is the most common cause of viral hepatitis worldwide, infecting millions of people each year. The HAV is mainly transmitted from person to person through the feces of infected people in person-to-person contact or through contaminated food and water [1, 2]. Hepatitis A outbreaks throughout the world, with humans as its sole host. According to the latest World Health Organization (WHO) estimates, more than 1.5 million clinical hepatitis A cases are reported annually. However, serological studies indicate more than tens of millions of cases of hepatitis A infection worldwide [1]. Different countries of

the world, even different parts of a country, have different infection rates [1, 2].

There is a direct and close relationship between the prevalence of hepatitis A infection in each community and the health status, access to safe drinking water, and socio-economic status of those communities. Person-to-person transmission of the virus is facilitated by economic poverty and limited health facilities. Most children in these communities become infected with hepatitis A before puberty and gain long-term immunity without developing clinical evidence of the disease [1-3]. The HAV enters the food cycle due to unhealthy behaviors, improper disposal of sewage, waste, and human feces,

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leading to contamination of individuals, and ultimately, their immunity. Nevertheless, this infection occurs at older ages due to improved economic and health status and improved quality of life. Thus, the contract and clinical signs become seriously more dangerous, and the prevalence of various forms of hepatitis B increases, leading to an increase in mortality rate [4-6]. According to various studies, factors affecting hepatitis A include health conditions, the extent to which people are exposed to the virus, and age [7]. Few studies have been conducted on the risk factors for hepatitis A outbreaks, which have largely addressed the prevalence or extent of the disease. Hence, due to the few studies conducted worldwide, especially in Iran, this study sought to identify risk factors and prevent similar outbreaks by breaking the transmission chain.

## MATERIALS AND METHODS:

In January 2019, two definite hepatitis A cases were reported by an infection prevention and control specialist at Sina Hospital, Karun County. Then, a team consisting of a doctor, a disease control expert, an environmental health specialist, a health worker, and a midwife were sent to the patients' residence (Ismailia village, located 35 km southwest of Karun city by the Karun river, the longest and the wateriest river in Iran) to study the outbreak. Active case detection by door-to-door visits throughout the village was then conducted. Thus, 21 definite hepatitis A cases were identified from when the hospital reported the cases to the end of the study period. It was decided to conduct a case-control study to identify risk factors for the disease. In this study, patients were those whose ELISA test was HAV IgM positive. All 21 patients were selected for the study. Controls were HAV IgM negative. Three controls were selected for each case using a random number table. A questionnaire of possible risk factors for the disease was then prepared. Independent variables were water consumption from desalination plant No. 1 (Mr. Zubeidi), water consumption from desalination plant No. 2 (Mr. Zahiri), history of vegetable consumption, history of swimming in Karun River, history of contact with patients, travel history, gender, and age. According to the questionnaire, patients and controls were asked about where to buy drinking water. Ismailia village had two private desalination centers, namely model RO\_24000 GOVARAB COMPANY, No. 1 (Mr. Zubeidi), and No. 2

(Mr. Zahiri). Residents provided their drinking water from the two centers mentioned above. Thus, it was assumed that water could be the source of the hepatitis A outbreak in this village. Moreover, given the incubation period of 15-50 days for hepatitis A, risk factors(s) were thought to be present, on average, 30 days before the onset of clinical symptoms. Therefore, the main problem of this study was recall bias. Hence, patients' information was extracted from other sources, such as their health records. Furthermore, the interviewers were not allowed to know some facts to avoid interviewer bias. The questionnaires were completed by a disease prevention and control expert and a health worker through interviews. The required data were collected and then imported into SPSS software. They were then analyzed through logistic regression.

## FINDINGS

According to the data described, 62% of patients were male, and 38% were female. Similarly, 15% of them had a travel history, and 85% had no travel history. On the other hand, 90% of them bought the water they needed from the desalination plant No. 1 (Mr. Zubeidi) and 2% from the desalination plant No. 2 (Mr. Zahiri). Moreover, 85% of them had a history of consuming vegetables, and 15% had no history of consuming vegetables. None of the patients had a history of swimming or consuming ice. Finally, 95% of them had a history of contact with a hepatitis A patient (Table 1).

The logistic regression analysis results showed a relationship between hepatitis A and water consumption from the desalination plant No. 1 (Mr. Zubeidi), adapted to other variables (p-value = 0.01 and OR: 11.6). Additionally, there was no relationship between hepatitis A and age, adapted to other variables (p-value = 0.83), and also between hepatitis A and gender, adapted to other variables (p-value = 0.70), between hepatitis A and swimming in Karun River, adapted to other variables (p-value = 0.99), and between hepatitis A and patient history (p-value = 0.99). Furthermore, there was a relationship between hepatitis A and water consumption from the desalination plant No. 2 (Mr. Zahiri), adapted to other variables (p-value = 0.00, OR: 0.03) (Table 2).

Investigations showed that the outbreak had two peaks on January 15 and 20, with a total of 12 confirmed cases hepatitis A disease (Fig 1).

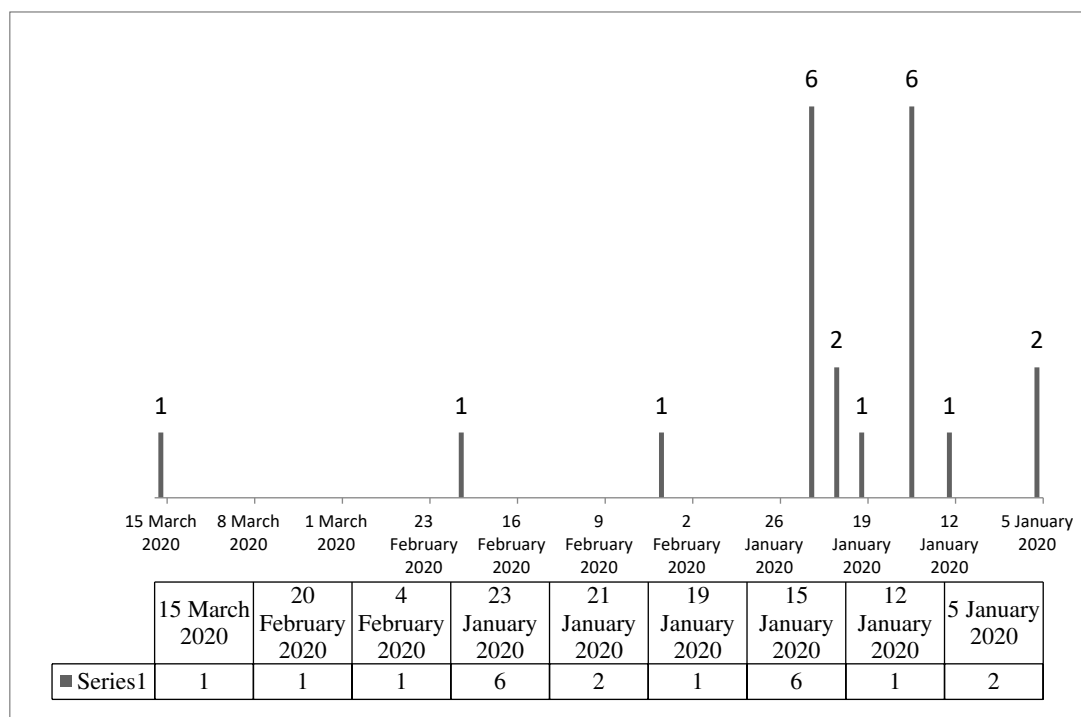


Figure 1: Frequency of hepatitis cases in Ismailia village, Karun city, based on the date of occurrence

Table 1. Frequency and percentage of risk factors in cases and controls

Variable	Case (N)	%	Control (N)	%
Male	13	62	35	66
Female	8	38	18	34
With a history of traveling	3	15	3	5
No history of traveling	18	85	50	95
The water is prepared from the Zahiri desalination plant	2	9	39	73
The water is not prepared from the Zahiri desalination plant	19	91	14	27
The water is prepared from the Zubeidi desalination plant	19	90	20	37
The water is not prepared from the Zubeidi desalination plant	2	10	33	63
With a history of ice consumption	0	0	0	0
No history of ice consumption	21	100	53	100
With a history of vegetable consumption	18	85	46	86
No history of vegetable consumption	3	15	7	14
With a history of swimming in the Karun River	0	0	6	11
No history of swimming in the Karun River	21	100	47	89
With a history of contact with patients	20	95	14	26
No history of contact with patients	1	5	39	74

Table 2. Results of the study of the relationship between risk factors and hepatitis A outbreak using logistic regression analysis

Variable	p-value	OR	0.95 CI
Age	0.83	1	0.93-1
Gender	0.70	1.3	0.24-8.1
Zubeidi	0.001	11.6	1.6-83
Vegetables	0.99	0.000	0.000

Swimming	0.99	0.000	0.000
Contact	0.99	187	0.000
Zahiri	0.00	0.03	0.00-0.24

## DISCUSSION AND CONCLUSION

HAV is the most common cause of viral hepatitis worldwide, infecting millions of people each year. It is transmitted mainly through the feces of infected people in person-to-person contact or through contaminated food and water [1, 2]. This study showed a significant difference between drinking water consumption from desalination plant No. 1 (Mr. Zubeidi) and the hepatitis A outbreak in Ismailia. This means that patients bought drinking water from Mr. Zubeidi desalination plant 11.6 times the healthy people. Since chlorination is performed manually in these private centers, the microbiological test for drinking water (E-coli) was negative at the start of the study.

Nevertheless, the amount of chlorine in the water at that time was reported as undesirable. The important point, however, is that before the outbreak within the incubation period of the disease, the drinking water distributed by Mr. Zubeidi was chlorinated, and it turned out that it has microbial contamination. No information was available. The distributed water is likely to be chlorine-free and microbially contaminated. Our study also showed a significant difference between drinking water consumption from desalination plant No. 2 (Mr. Zahiri) and the hepatitis A outbreak in Ismailia. This means that patients bought drinking water they needed from Mr. Zahiri's desalination plant 0.03 times the healthy people. Various studies in the United States indicate the unknown source of most cases of hepatitis A. It is hypothesized that the person-to-person transmission of infection occurs, especially in childhood [8-10]. A study conducted in Italy entitled "The incidence of hepatitis A risk factors" showed that hepatitis A in this country is mainly transmitted through food [11]. Other variables of this study, including age, gender, history of swimming in the river, history of vegetable consumption and history of contact with patients, did not suggest any significant difference.

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