

Hepatitis C Virus can be Transmitted through Water: A Short Communication

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Abstract

Global burden of hepatitis C is increasing with 1.75 million new cases of Hepatitis C virus infection were diagnosed in 2015. Hepatitis C is transmitted through intravenous drug use, blood transfusion and, needle stick injuries. In approximately 40% of hepatitis C patients, modes of hepatitis C transmission could not be identified. This article hypothesizes water as a hepatitis C transmission source and provides new areas of consideration for hepatitis C transmission.

Keywords: Hepatitis C Virus; HCV Water Contamination; Water; Transmission

Abbreviations

HCV: Hepatitis C Virus; WHO: World Health Organization; UNICEF: United Nation International Children's Emergency Fund

Introduction

Hepatitis C is a viral infection of the liver which is caused by hepatitis C virus [1]. It causes acute as well as chronic infection. Chronic hepatitis C infection can lead to fibrosis, cirrhosis and hepatocellular carcinoma. Globally, more than 185 million people are seropositive for hepatitis C virus infection and 70 million people are suffering from chronic hepatitis C infection [2]. The prevalence of HCV is increasing. In 2015, 1.75 million new cases of HCV infections were recognized [3]. There are various modes of transmission of HCV. Currently, known modes of transmission of hepatitis C virus are following:

Parenteral

1. Blood and blood products
2. Intravenous drug use.
3. Solid organ transplantation
4. Needle stick injuries.
5. Traditional healing practices
6. Contaminated medical equipment use.
7. Tattooing
8. Piercing
9. Shaving

Non-parenteral

1. Sexual Transmission
2. Vertical transmission (in utero or perinatal)

Miscellaneous

1. Insect vectors
2. Sharing razor with hepatitis C virus-infected patients.
3. Broken skin contamination with infected serum, blood and, saliva [4,5].

Besides all these, in about 40% of cases, modes of HCV transmission could not be identified [6]. In order to prevent new cases of HCV, new modes of transmission other than above mentioned should be sought. This is a hypothetical short communication which diverts our attention towards considering water as source of HCV transmission in the light of HCV data extracted from systemic review and water, sanitation and hygiene data from WHO and considering the finding that HCV can survive in water for weeks [4].

Contamination of Water with HCV

Hepatitis A and E have long been known to be transmitted through feco-oral route. HCV is never found to be transmitted through water. Water is well known for transmitting various bacterial and viral infections [7]. Diseases caused by contaminated water is a major public health problem. According to WHO, 423 million people use water from unprotected wells and springs and 159 million people rely on untreated surface water which includes streams, lakes, ponds, channels and irrigation system. These water resources can also get exposed to the hepatitis C virus (HCV) [3]. Recently, Hepatitis C virus has been studied to survive in water for up to 3 weeks which make it susceptible to be transmitted through water [4]. Possible ways through which HCV can contaminate community water resources are:

1. Spitting HCV contaminated saliva in community water resources.
2. Exposure of community water resources to HCV contaminate blood.
3. Leakage of HCV contaminated sewage into community water resources.
4. Collecting water from community water resources with contaminated containers.

Hepatitis C virus has been detected in saliva of hepatitis C virus carriers as well as in salivary gland tissues. Occult mouth bleeding and tooth brush sharing can cause HCV to enter into saliva. Cases of hepatitis C virus transmission from human bite have also been reported [8,9]. Spitting saliva publicly is a habit and common practice in some countries [10]. If HCV contaminated saliva enter into community water resources which are not regularly or properly treated, those water resources can become the reservoir of HCV and cause HCV transmission in a large number of people.

HCV contaminated blood can also expose unprotected wells, springs and surface water to HCV. If a person with HCV gets injured while collecting water from community water resources and blood seeps out of their wounds, community water can become a reservoir of HCV if remain untreated or improperly treated.

HCV patients with hematuria, bleeding per rectum and menstruation can cause HCV contamination of sewage water. If contaminated sewage water gets leaked into community water resources, they will become HCV reservoir.

HCV was studied to survive in water bottles and container even after cleaning especially to plastic and aluminum bottles [4]. If HCV contaminated water bottles or containers are used to collect water from the community water source, they can contaminate the community water resources.

Contamination of Water with HCV

HCV can be transmitted through the following ways:

1. When normal individuals with open wounds, broken skin and, skin ulcers are exposed to contaminated water for example during swimming in surface water and amusement parks.
2. When people with mouth ulcers, mucosal abrasion, gingivitis, tonsillitis, cheek bites, tongue bites, mouth sores and other gastrointestinal problems drink HCV contaminated water, they can acquire HCV infection.

Betel nuts are masticatory substances that are customary in several countries [11]. Betel nuts due to their hard consistency traumatize oral mucosa which renders mucosal vessel open and subject to HCV exposure.

Data

HCV data (2015) were obtained from the systemic review published in 2016 which described the global burden of HCV. Data for drinking water, sanitation and hygiene (2015) were obtained from UNICEF drinking water sanitation, and hygiene database [12] <https://data.unicef.org/topic/water-and-sanitation/drinking-water/>.

Countries with highest and lowest incidence of chronic HCV infection are shown in figure 1 and 2 respectively. China, India, and Pakistan carry the highest burden of HCV infection.

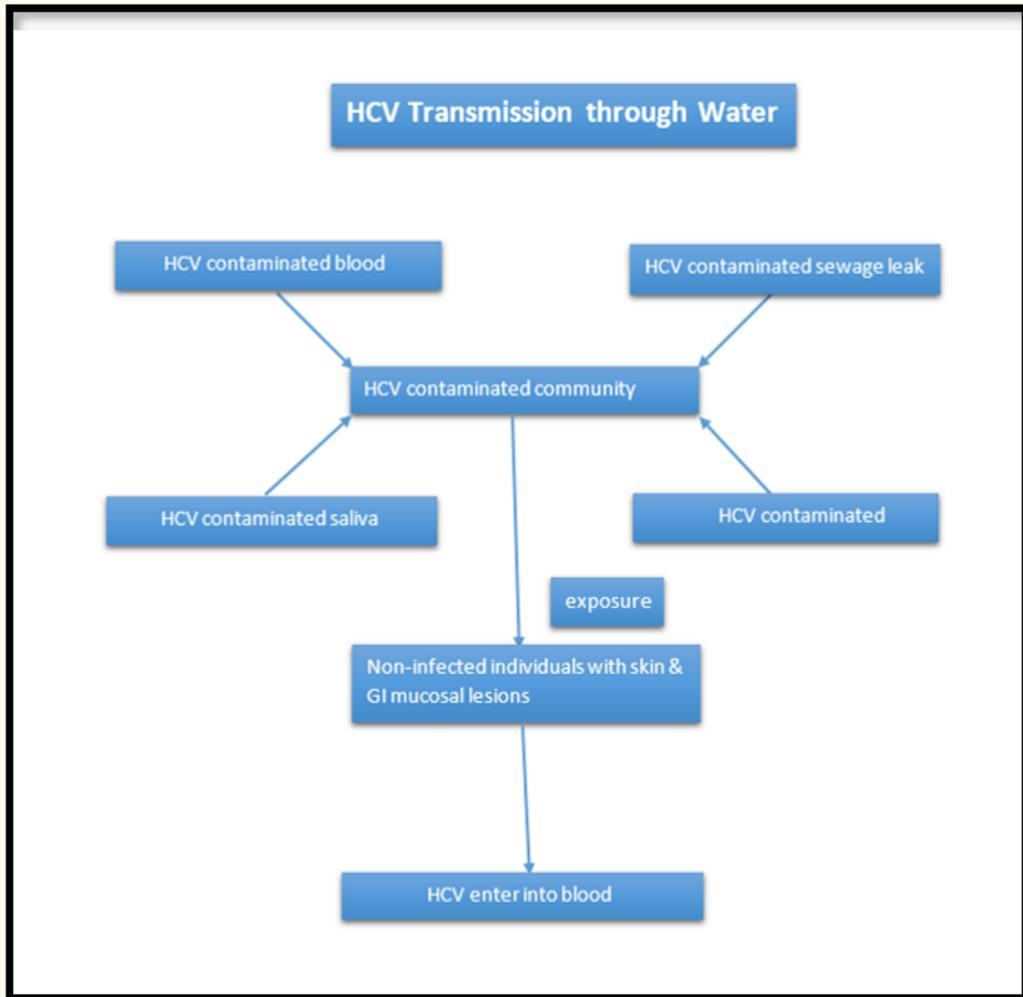


Figure 1: Possible Mechanism of HCV transmission through water.

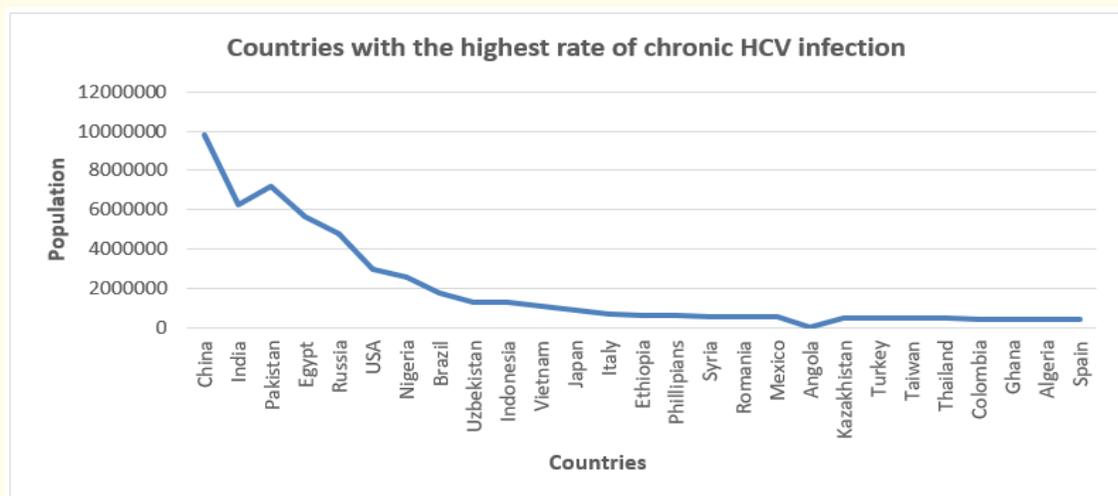


Figure 2: Possible Mechanism of HCV transmission through water.

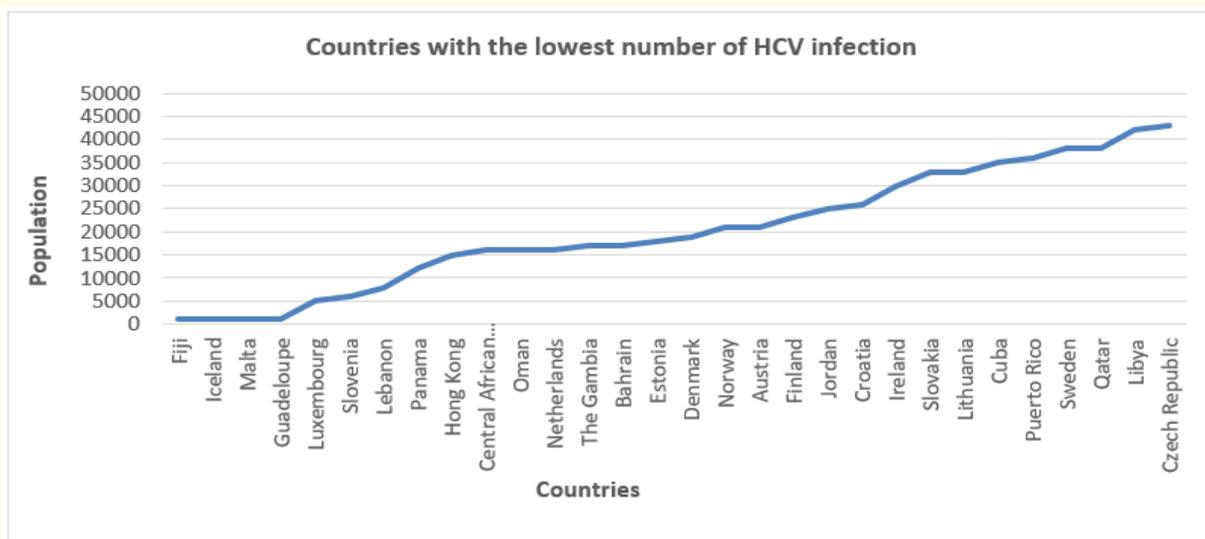


Figure 3: Countries with the lowest prevalence of chronic HCV infection [13].

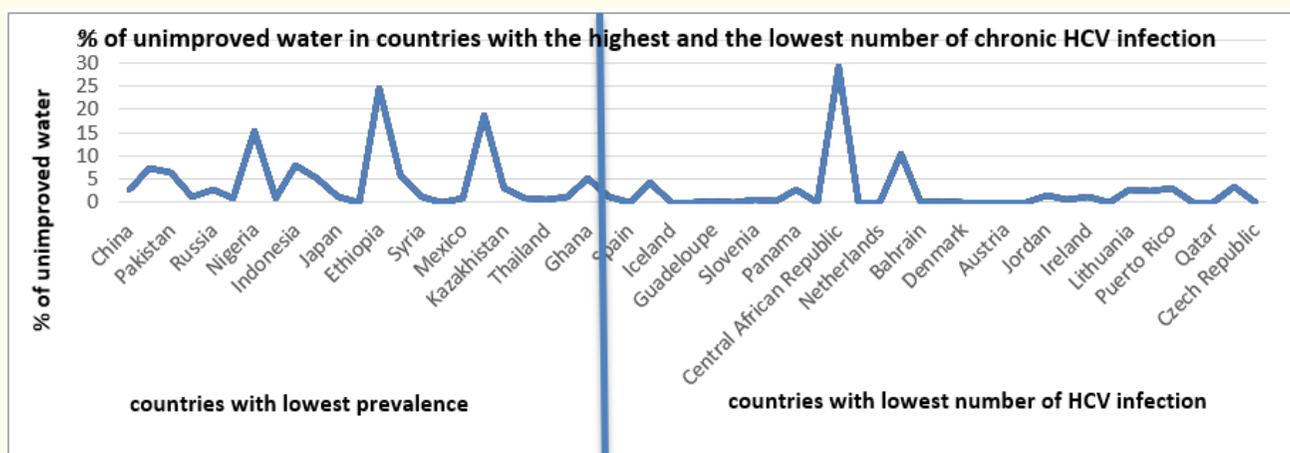


Figure 4: Comparison of unimproved drinking water source in countries with the highest and the lowest number of HCV infection [12-14].

Comparison of data on unimproved drinking water from countries with the highest and lowest number of chronic HCV infection depict unimproved drinking water use is higher in countries with a high prevalence of HCV infection. Unimproved or unsafe drinking water use is also found in countries with the lowest HCV number. However, this could be explained by the fact that while considering HCV transmission through water several factors need to be considered. Special attention should be given to countries with higher number of chronic HCV infection, a higher unimproved drinking water use and factors of mouth ulceration and trauma are present as compared to countries with a lower number of chronic HCV infection, unimproved drinking water use and factors for mouth or skin ulceration.

Limitations

Limited data accessibility and no previous case of HCV transmission of water are two major limitations. This is a hypothetical paper which diverts attention to consider water as a possible source of HCV transmission.

Conclusion

The fact that, risk factors of HCV in a large number of patients are not detected, water can be the source of hepatitis C transmission in these people. HCV can survive in water for up to 3 weeks which makes it susceptible to be easily transmitted to people with broken skin, gastrointestinal mucosal lesions. When HCV contaminated water touches the broken skin or mucosa of those people, HCV can easily infect a person. More research needs to be done on water as a source of HCV transmission and appropriate precautions should be taken to avoid HCV transmission through water. WHO and government agencies of highly susceptible countries should take measures and exercise precautions to avoid HCV transmission through water.

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