

## Blood-Borne Infections in Tattooed People

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### Abstract

**Background:** Tattoos are associated with blood-borne infections that result from viruses such as the hepatitis B virus (HBV), the hepatitis C virus (HCV), and the human immunodeficiency virus (HIV). This association is equally evident among people without major risk factors and among those with major risk factors like injected drug users (IDUs).

**Objectives:** In this study we evaluated all tattooed patients admitted to our hospital (the Boo-Ali hospital in southeastern Iran) between February 2006 to January 2015.

**Patients and Methods:** The patients enrolled in our study were admitted to infectious disease wards for different illnesses (e. g., Pneumonia, Sepsis, Tuberculosis, etc.). We only studied the patients who agreed to be included in our study. When we found at least one tattooed area, regardless of its size, we took a blood sample and tested it for the presence of HIV, HBV, and HCV.

**Results:** Among the 63 patients with tattoos (21% female, 79% male, age range: 16 to 79-years-old), four patients (6.3%) tested positive for HBsAg and PCR-HBV, seven patients (11%) tested positive for HCV, and five (7.9%) tested positive for HIV. The last group consisted in IDUs and all five had several tattooed areas on their bodies.

**Conclusions:** Upon our results, tattooed people even with a small size of tattoo on the body are more at risk for HCV, HBV, and HIV infection.

**Keywords:** HBV, HCV, Tattoos, HIV

## 1. Background

Tattoos are the result of small piercings in the skin by a needle where small amounts of differently colored ink are injected under the surface of the skin. When the tattoo's area is larger more injections will be needed. As a result, the risk of infection is higher. Each injection exposes the needle to blood and only one infected injection is needed to spread the infection among individuals who use shared instruments (1-4). There is no problem if the needle is only used for one person. But, if the tattoo artist used the needle on someone else, then it is possible to transmit blood-borne viruses to others if one of tattooed persons is infected. Therefore, these shared injections can transmit infections caused by the hepatitis B virus (HBV), the hepatitis C virus (HCV), and the human immunodeficiency virus (HIV) to exposed individuals. Usually, a person could not be infected by a blood-borne virus through social contact with another person (1, 5-11).

Blood-borne viruses are present in higher concentrations when compared to what is typically found in normal body fluids. These viruses can be transmitted sexually, by direct exposure to infected blood, or by di-

rect exposure to other body fluids contaminated with infected blood. Among health care workers, like laboratory staff, direct exposure can occur through the accidental contamination of a sharp instrument that punctures the skin. For example, a needle may pick a lab technician or infected body fluids (such as blood) may come into contact with mucous membranes (e. g., in eyes, nose, or mouth). The rate of viral transmission is depends on the route of transmission, the type of virus, and the immune level of the exposed person (4, 5, 8-13). The most common routes of transmission for each virus includes: sexual intercourse (common for HBV, HIV and less common for HCV); sharing injecting equipment (efficient for HBV, HCV and HIV); skin puncture by blood-contaminated sharp instruments (e. g., via a shared needle); and, the splashing of infected fluids to the mucous membranes (1, 4, 8, 13). The overall risk of contracting HBV, HCV, and HIV, which can transmit by an infected patient to a healthcare worker (HCW), are 30%, 3%, and 0.3%, respectively (2, 4, 13). But, these rates differ for tattooed people in different countries (1, 6, 8, 10, 14-22).

## 2. Objectives

We aimed to evaluate the rate of infection of three most common blood-borne viruses (HBV, HCV, and HIV) in hospitalized patients with tattoos.

## 3. Patients and Methods

In this survey we evaluated all of the tattooed patients admitted to the Boo-Ali hospital in Zahedan (located in southeastern Iran) between February 2006 to January 2015. These patients were admitted to infectious disease wards for different illnesses (e. g., Pneumonia, Sepsis, Tuberculosis, etc.). When we found at least one tattooed area even in small size, the blood sample was taken and sent for testing of HIV, HBV, and HCV. The primary screening test used in this study was the enzyme linked immune-sorbent assay (ELISA). When this test showed that a patient was HIV-positive, a second test was performed, and finally HCV and HIV infections were approved by polymerase chain reaction (PCR). To detect HBV, HBsAg, anti-HBc were evaluated, and in the case of positive results, PCR-HBV was also tested. Patients who did not agree to this testing were excluded from our study.

## 4. Results

A total of 63 patients with tattoos were enrolled in our study. Of these, 21% were female, 79% were male, and the patients' ages ranged from 16 to 79. Fifteen cases were anti-HBc positive, but four patients (6.3%) tested positive for HBsAg and PCR-HBV. Seven patients (11%) had a HCV infection and five cases (7.9%) tested positive for HIV. The last group of patients was made up of IDUs and each had more than one tattoo. Also, four patients in the HIV-positive group were incarcerated at least once. We compared the infection rates and the overall risk associated with the three most common blood-borne viruses (BBVs) in this group to the risks and rates of the general population in Iran (23-26). Following this analysis, we found significant differences between the rate of BBVs (specifically, HCV, HBV, and HIV) in two groups ( $P < 0.5\%$ ). None of the HIV patients had a CD4 that was less than 350. In the HCV positive group, polymerase chain reaction was also positive and none of the HBV-positive patients had a positive result for HBeAg.

## 5. Discussion

In our study of 63 patients with tattoos, 6.3% tested positive for HBV, 11% tested positive for HCV, and five patients (7.9%) tested positive for HIV. Blood-borne viruses include HVB, HVC, and HIV. These infections can be transmitted from person to person through infected blood, unsafe sexual contact, or from an infected mother to her child. Significant risk factors associated with contracting HVB, HVC, or HIV includes injecting drugs and getting tattoos by using shared needles (4, 8, 16). Our results show that the rates of HCV and HIV infection were higher among

people with tattoos (11% and 7.9%, respectively) when compared with prevalence of these infections in general population in Iran.

In a study by Nishioka et al. 345 cases were examined (of those 182 persons had tattoos). These researchers found that having a tattoo was associated with high rates of HCV infection. But, the researchers did not find a significant association between tattoos and either HBV or HIV infections (8). In a multicenter, case-control study by Carney et al. the authors found that individuals who tested positive for HCV had one or more tattoos more than the non-tattooed population ( $P < 0.001$ ) (1). Holsen's et al. (17) survey revealed that IDU was the main risk factor associated with HCV infection, and that tattoos were a significant independent risk factor (17). In Ko's study, the association between HCV infection and tattoos was studied in tattooed ( $n = 87$ ) and non-tattooed ( $n = 126$ ) young men who did not have history of injecting drugs or of engaging in sexual activity with multiple partners. In this study, 11 of the 87 tattooed individuals and three of the 126 non-tattooed individuals were positive for anti-HCV and 25 tattooed subjects carried the hepatitis B surface antigen (HBsAg) (18). Abiona's study revealed that tattoos and body-piercings in prison were important risk factors associated with the transmission of BBV infections (20).

In Alipour's et al. (27) study, the prevalence of co-infection with HIV/HCV was 78.4%. Also, this study revealed that the follow behaviors were significantly associated with HCV/HIV co-infection: injecting drugs (OR = 7.2; 95% CI: 4.9 - 10.6), receiving tattoos in prison (OR = 2.61; 95% CI: 1.4 - 4.8), and receiving tattoos outside of prison (OR = 2.0; 95% CI: 1.3 - 3.1) (23). Sebastian et al. conducted a survey of 200 healthy individuals with tattoos and 200 non-tattooed individuals. They found that the prevalence of HBsAg in tattooed and non-tattooed people was 19.5% and 9%, respectively. There was a significant difference between two groups ( $P < 0.01$ ) (21). In a 2005 study by our research team, 7.9% of 39 tattooed women were HBsAg-positive, and we found that only one of these cases tested positive for HCV. In one case we observed a positive HIV test result where the participant had a history of immigrating to a neighboring country (28).

Among prisoners in some countries, the rate of infection with blood-borne viruses is high. This rate is higher when the prisoners have tattoos (1, 5, 11). Today, injecting drugs is the most common way to acquire HVC. Individuals who inject drugs become infected when they share contaminated needles with infected individuals. This is similar to what happens to people who receive tattoos through the use of shared needles, who have large tattoos, or who have multiple tattoos (1, 15, 19). HVB is more common in some parts of the world such as southeastern Asia, Africa, the Middle East and the Far East as well as in southern and eastern Europe. In some countries the rate of infection is as high as 10% (4, 27, 28). The prevalence rate of BBVs varies in different countries and this rate

is dependent on the specific risk factors found in these countries. The rate of HIV infection is also markedly different between countries. Sub-Saharan Africa is the most affected region in the world. About 1 in every 20 adults infected with HIV lives in this area. Rates of infection with HIV, like HBV and HCV, depends on specific risk factors and the prevalence of high-risk behaviors, such as having unsafe sex, sharing needles, homosexuality, and having tattoos. One study from England revealed that 1.5/1000 people (1.0 in Female and 2.1 in male) were infected with HIV in 2012. But, the prevalence rate was higher in patients who engaged in unsafe sexual contact, who were IDUs, and who had tattoos (29, 30).

All of the studies described above, including our studies (the present survey and the previous study conducted in this area in 2005), showed that people with tattoos have an increased chance of becoming infected with blood-borne viruses (28). The best way to decrease the incidence of blood-borne infections is to acknowledge the transmission routes. People must know that body-piercing equipment was sterilized properly, and they should also know not to share body-piercing equipment. They should always use new needles and syringes. They should avoid injecting drugs and they should never share any needles used to inject drugs. Also, people should know that it is important to have a safe sex by using condoms.

Tattoos are an important indicator of HCV, HBV, and HIV infections, as we found in our study. The increasing prevalence of tattoos in the general population, specifically where shared needles are used, can increase the incidence of BBVs. We should test the blood-borne viruses in everyone who has a tattoo.

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## Footnote

**Authors' Contribution:** Designed the work: Seyed Mohammad Hashemi-Shahri; write the paper: Batool Sharifi-Mood, Masoud Salehi, and Maliheh Metanat; English edit version: Roshanak Sharifi.

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