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The Prevalence of Hepatitis B, C and HIV among Injection Drug Users in the USA

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ABSTRACT

Blood-borne pathogens such as Hepatitis B Virus (HBV), Hepatitis C Virus (HCV) and Human Immunodeficiency Virus (HIV) are commonly associated infections among Injection Drug Users (IDUs) within the USA. The purpose of this study is to measure the prevalence of these infections and co-infections among IDUs based on demographic factors such as income status, geographical region, age, race and gender. There is a rising trend observed in these infections over the past few years, mainly in injection drug users, as these are primarily transmitted via direct contact with bodily fluids during needle sharing.

An electronic literature search was performed and the search was limited to peer-reviewed articles published from January 1, 2000 until June 30, 2019, with our focus concentrated within the USA due to the rising injection drug use epidemic.

Based on the peer-reviewed articles, the prevalence rate of HBV and HCV was consistently found to be increasing with age but actually decreased in HIV patients. Geographically, more cases were reported in the Northeast area, particularly among the white, followed by the Midwest and the West of the USA. The prevalence rate was found to be higher among women and roughly 37% of them are younger than 35 years of age. Overall, the number of infections by HBV, HCV and HIV has shown an increasing trend over the years, 2009 to 2016, among IDUs. Co-infection with HBV and HCV was also observed to be higher in the HIV patients mainly due to the same mode of transmission and impairment to the immune system.

This study indicates that injection drug use still remains the most common means of transmission for HIV, HBV and HCV within the USA. There is an urgent need to implement more awareness among communities who are at high-risk to enforce better prevention protocols and proper medical treatment.

Keywords: Hepatitis B virus (HBV), Hepatitis C virus (HCV), Viral hepatitis, Human immunodeficiency virus (HIV), Injection drug users (IDUs)

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INTRODUCTION

Blood borne viruses such as human immunodeficiency virus (HIV), hepatitis C virus (HCV) and hepatitis B virus (HBV) are the most common viral pathogens among injection drug users (IDUs) [1,2]. These infections are attributed to serious health complications including, chronic liver diseases in HCV and HBV infections and severe opportunistic diseases in HIV infection [3]. People who inject drugs are vulnerable in acquiring and then transmitting these infections to other individuals. Globally, there has been an increase in the number of IDUs, particularly in low-income and middle-income countries, such as some countries in Africa [4]. The primary reason for their susceptibility may be due to the sharing of needles and equipment(s) that are used for injections. Laws and legislations that prohibit the use of illegal drugs have played a central role in shaping the health outcome among injection drug users [5]. There is supporting evidence that the criminalization of drug-use harms people seeking prevention and treatment, especially HIV-positive individuals [5].

There are various modes of transmission for these 3 viruses. HIV is spread when certain bodily fluids come in contact with mucous membranes or damaged tissues. These include blood, semen, pre-seminal fluids, rectal fluids, vaginal fluids and breast milk [6]. HIV is commonly transmitted during sexual intercourse and the sharing of injection drug equipment(s) in the United States of America (USA) [6]. In the case of IDUs, bodily fluids directly enter the bloodstream from injecting needles or syringes. Similar to HIV, HBV is spread when blood, semen or other bodily fluids enter the body of a non-infected individual [7]. However, HBV is not spread through food or water, sharing eating utensils, breastfeeding, hugging, kissing, hand-holding, cough or sneeze [7]. Lastly, HCV is spread when blood enters the body of a non-infected individual, similar to HIV and HBV. Although it is less common to get HCV from sexual contact or even sharing a toothbrush or razor, it may be possible to transmit the virus if it came in contact with infected blood [8]. Risk factors for HCV infection include transfusion of blood and blood products and transplantation of solid organs from infected donors, illegal injection drug use, unsafe therapeutic injections, occupational exposure to blood (primarily contaminated needle sticks), birth to an infected mother, sex with an infected partner and sex with multiple partners; however, transfusion from unscreened donors, injection drug use and unsafe therapeutic injections are the most important source [9].

Human Immunodeficiency Virus (HIV) is a well-known chronic viral illness in the USA and a cure for this life-threatening disease is not yet available, but the highly active antiretroviral therapy (HAART) helps in the management of people with the condition. However, the use of appropriate prevention strategies is fundamental to decreasing the risk of acquiring HIV infection, such as the use of HAART regularly for those who have the disease in order not to infect others, the use of pre and post-exposure prophylaxis in HIV exposure events and the use of personal protective equipment (PPE) to avoid contact with body fluids [10]. It is estimated that there are approximately 11.8 million people who inject drugs worldwide and 13.1% of them are living with HIV infections [11]. In the USA, there were 766,385 males and 240,306 females living with HIV by the end of 2016 [12]. Approximately 10% of the infections are attributed to injection drug use in males and 21% in females [12]. In 2017, there were 38,739 people in the USA with newly diagnosed HIV and 2,389 were transmitted through injection drug use [13].

Compared to HIV, there are a total of 2,967 new reported cases of acute hepatitis C infections in the USA in 2016 [14]. There was an incident rate of 0.8 cases per 100,000 populations in 2015, whereas in 2016 the incident rate rose to 1.0 case per 100,000 populations [14]. The data from the CDC in 2016 indicated that 1,118 cases out of the 2,967 cases, or roughly 68.6% of the infected individuals, reported having had used injection drugs in the past [15]. It has been identified that HCV infection is more infectious than HIV infection among IDUs [16]. However, both HIV and HCV are blood borne viruses transmitted through direct contact of contaminated blood, so co-infection of HIV and HCV is common with approximately 62% to 80% among HIV-positive IDUs [17].

Similarly, co-infection between HBV and HIV is very common among IDUs due to the same reason of mode of transmission [17]. There was an estimate of 2.2 million people in the USA in 2016 that were chronically infected with hepatitis B virus [18]. According to the Centers for Disease Control and Prevention (CDC), there has been a drop in the number of cases in recent years, from 8,036 cases in the year 2000 to 3,218 cases in the year 2016 due to routine vaccination since 1991 [19]. However, the number of infections has been steadily increasing since 2014, likely due to the increasing number of drug users [18].

The increasing prevalence of HIV, HBV and HCV is becoming a public health concern, partly related to the rising drug epidemic among IDUs in the USA [20]. Therefore, injection drug use remains the most common means of transmission for these infections in the USA. The purpose of this paper is to review the prevalence of HIV, HBV and HCV including co-infections among IDUs as well as, associated social health determinants such as geographic distribution, gender, age and race.

METHODOLOGY

An electronic literature search was performed using PubMed, Google Scholar, EBSCOhost, Mendeley and MedLine Plus. The search was limited to peer-reviewed articles published from January 1, 2000, until June 30, 2019. An article was selected if it included keywords such as the

prevalence of hepatitis B virus (HBV), hepatitis C virus (HCV), viral hepatitis, human immunodeficiency virus (HIV) and injection drug users (IDUs). Articles were then reviewed and included based on the applicability to the topic.

HBV, HCV, HIV and co-infections data in IDUs

Surveillance data is of utmost importance in determining the prevalence of the viral pathogens among IDUs. However, the number of reported cases does not reflect the true number of actual cases occurring, as many people do not seek health care or are unable to do so.

The prevalence of HBV and HCV infection has been shown to increase with age, whereas the prevalence of HIV was lowered as age increased. However, HIV was seen to be greater in the Northeast than in the Midwest and West of America [21]. Also, 35% of the persons tested were female with 37% being younger than 35 and 43% were white/Caucasian [21].

The data in **Figure 1** shows the number of reported cases of HBV that included information about injection drug use from the years 2009 to 2016 [22]. An estimated, 23.23% (n=2,608) indicated the use of injection drugs of the 11,226 cases reported from the years 2009 to 2016 [22]. As seen in **Figure 1**, the number of IDUs increased.

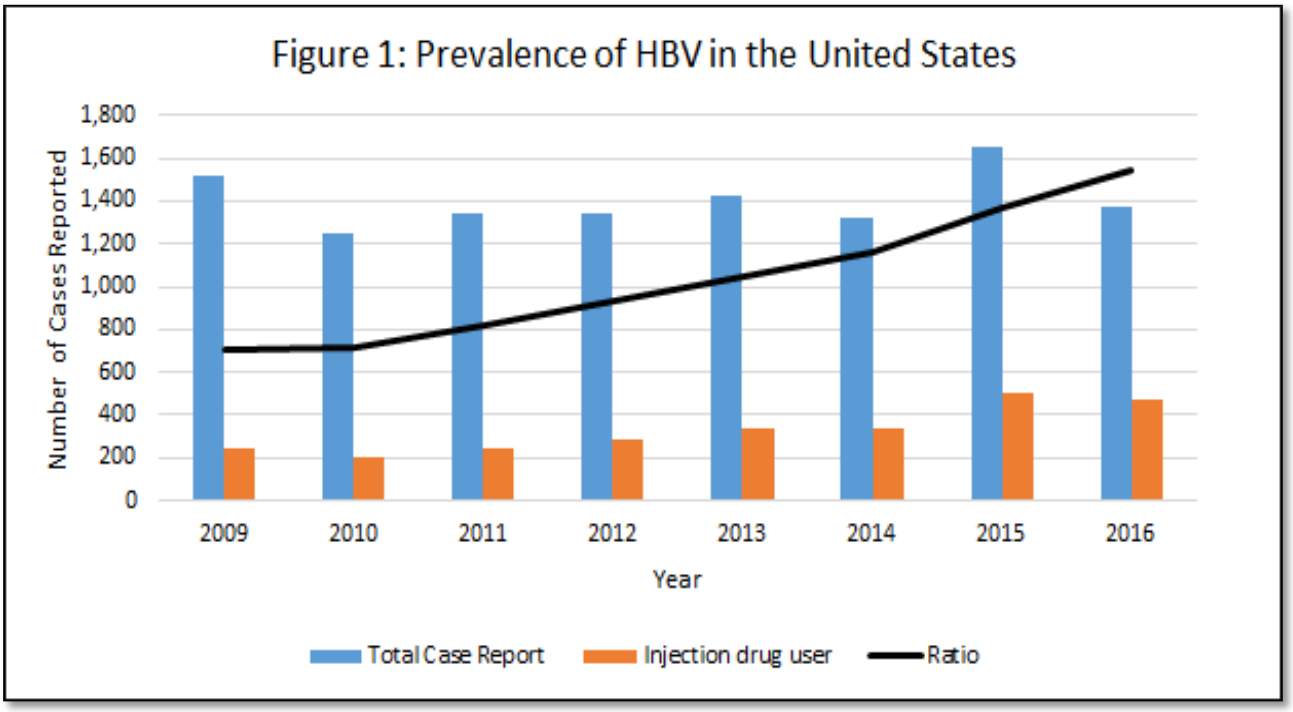

Figure 1: Prevalence of HBV in United States.

Note: *Data sourced from CDC - Viral Hepatitis Surveillance United States [22]*

The data in **Figure 2** shows the number of reported cases of HCV that included information about injection drug use from the years 2009 to 2016 [22]. An estimated, 62.99% (n=4,159) indicated the use of injection drugs of the 6,603 cases reported from the years 2009 to 2016 [22]. The number of IDUs increased significantly as the years went by. These reported users were mainly among the young people who live predominantly in the Eastern and Midwestern States, are white and have a history of injection drug use [23,24].

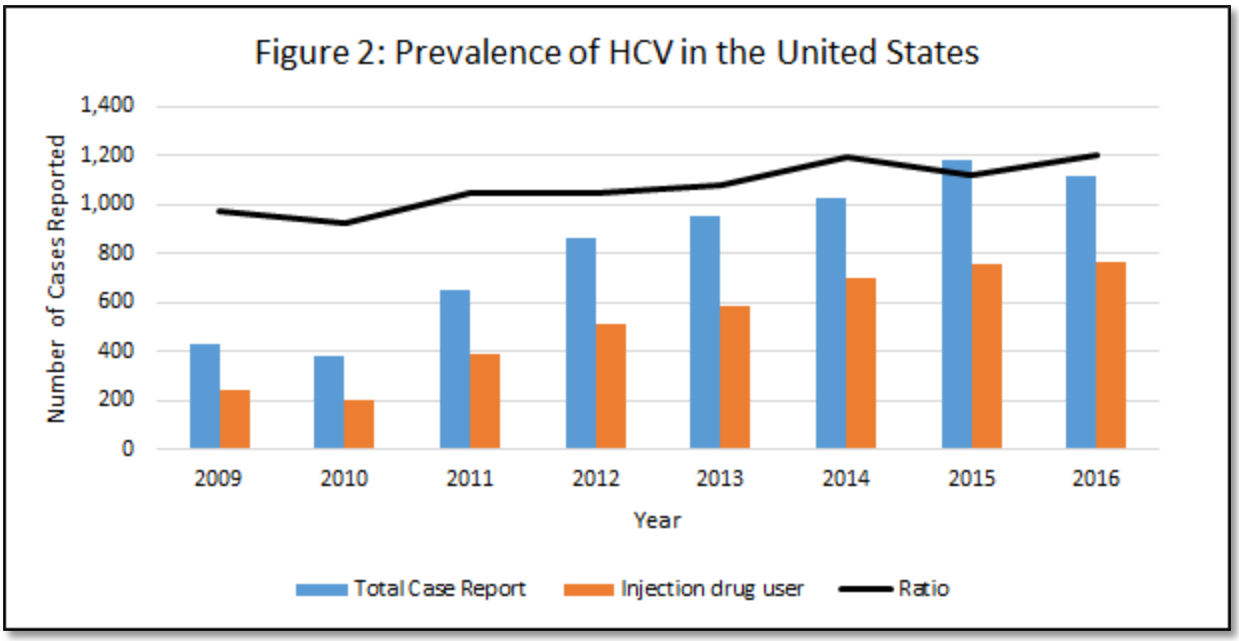

Figure 2. Prevalence of HCV in the United States.
Note: *Data sourced from CDC - Viral Hepatitis Surveillance United States [22]*

The data in **Figure 3** shows the number of reported cases of HIV that included information about injection drug use from the years 2009 to 2016 [25]. An estimated, 6.11% (n=14,763) indicated the use of injection drugs of the 241,677 case reports from the years 2009 to 2016 [25].

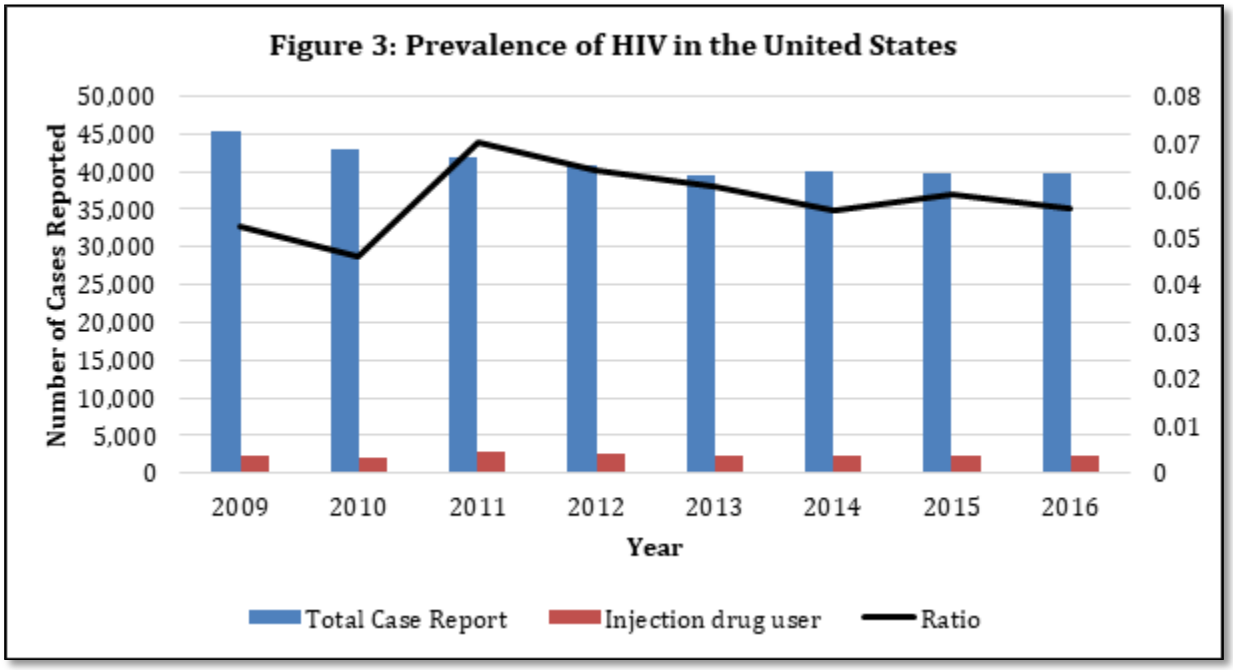

Figure 3. Prevalence of HIV in the United States.
Note: *Data sourced from CDC - Diagnoses of HIV infection in the United States and dependent areas, 2009-2016 [25]*

Individuals with HIV are at high-risk for other infections, including HBV or HCV [26]. This can be attributed to their shared modes of transmission, i.e., blood borne via IDUs [27]. HIV, as a primary infection, weakens the immune system's response to invading infectious pathogens and studies have shown that co-infection with HBV and HCV exacerbates the natural history of hepatitis infection [28]. In the case of HBV, the outcome of co-infection is dependent

on the age and immune status of the patient [29]. Approximately, 50% to 90% of patients who have HIV and acquire HBV early, progress to chronic HBV [29]. In contrast, 5% of HIV uninfected individual's progress to chronic disease [29]. Furthermore, the 2 blood borne pathogens most frequently transmitted among drug users via multi-person use of syringes and other injection equipment(s) are HIV and HCV [2]. Among IDUs worldwide, HIV prevalence varies from less than 5% to greater than 80%, whereas a higher consistency is shown in HCV prevalence (50% to 90%) [2]. Both environmental and viral factors favor a more rapid spread of HCV among IDUs, whereas HIV may be somewhat slower [2].

RESULTS AND DISCUSSION

Most studies have shown an increased prevalence of blood borne pathogens among IDUs, mainly hepatitis C [14]. HIV, HBV and HCV are all blood borne viruses with similar transmission routes and therefore, injection drug use increases the risk of co-infection amongst these groups [30]. However, this number does not outline the actual number of infections, as it is mainly based on the cases reported by patients who experienced the symptoms and sought medical treatment, excluding the number of cases which were not even reported by the patients [21]. Even though men have the comfort of a higher social and economic status in comparison to women, they are less likely to look for health care, get tested or even initiate treatment for HIV [11].

Of the 3,218 total cases reported to CDC in 2016 regarding acute HBV infection, only 472 cases were confirmed IDUs with data missing to confirm injection drug use in 1,847 cases and the rest of the cases denying injection drug use [25]. Similarly, of the 2,967 cases reported to the CDC in 2016 regarding acute HCV infection, only 767 cases were confirmed IDUs with data missing to confirm injection drug use in 1,849 cases and the rest of the cases denying use [25]. An estimated, 241,677 cases of HIV were reported among IDUs from the years 2009 to 2016 [25].

Individuals with HIV have a 33% higher chance of being co-infected with either HBV or HCV, in comparison to the public [31]. Viral hepatitis causes many undesirable impacts on healthcare systems worldwide, leading to an increased risk of liver fibrosis, cirrhosis, end-stage liver disease, hepatocellular carcinoma and ending in a high mortality rate [31]. An estimated, 27.9% of IDUs globally are under the age of 25 years old and with a history of being homeless, in unstable housing or incarcerated [4]. In 2017, 292,347 people in the USA had been diagnosed with HIV, classified as Stage 3 (AIDS), due to injection drug use [7]. IDUs have a higher rate of infection with HIV, HBV and HCV due to the sharing of needles and other drug paraphernalia [1]. In 2009, co-infection with HIV, HCV and HBV was about 62% to 80% in HIV infected IDUs due to the same mode of transmission [17]. Injection drug use in HIV positive individuals remains the most common cause of HCV in the USA, with sexual transmission coming second on the list [17]. In 2016, 42 states had reported a total of 148,932 cases of chronic HCV to the CDC [22]. Similarly, 42 states had reported a total of 2,967 cases of acute HCV cases to the CDC [22]. Despite the increase seen in reported cases from 2015 to 2016, the actual number of acute HCV cases is estimated to be even higher, at 13.9 times the recorded number, due to a large number of cases not being reported [22]. Similar findings of increased prevalence of HIV, HCV and HBV amongst IDUs are also found in other parts of the world [4]. HIV prevalence in injection drug users has remained fairly consistent since the 1980s in the USA [21]. Areas of high densities and larger social networks are at a higher risk of coming in contact with someone who is HIV positive [21].

However, due to certain limitations in these studies, the actual number of cases reported by IDUs is unknown, as many patients never seek medical treatment, such as men, people in lower socioeconomic classes, individuals under 25 years old, history of incarceration and gay men [12]. Another obstacle we face is the criminalization of injection drugs, which harms reporting of diseases and seeking of treatment [5]. This could be fixed by promoting awareness among high-risk communities, having clean needles and proper follow up [12]. Drug treatment programs are targeted towards older IDUs due to them having a longer and more established drug history, but these programs should also target younger people with lesser education [21]. Increased awareness and education among these communities would certainly lead to reduced numbers of blood-borne infections [12]. Comparatively, in 2016 there was a 4.5% decrease in the reported cases of acute HBV [22]. This trend could be attributed to ongoing vaccination guidelines for HBV adults at risk or in high-risk settings, as well as adults requesting HBV vaccinations on their own accord [22]. The current lack of HCV vaccination protocols, as well as the lack of HCV screening, provides difficulty; especially considering a good portion of HCV infected patients can remain asymptomatic for a prolonged period [22].

CONCLUSION

HIV, HBV and HCV are all well-known chronic illnesses with no known cure. Injection drug use remains the most common means of transmission for these illnesses within the USA. Due to this alarming statistic, it is worthwhile for the medical community to continually review the prevalence of HIV, HBV and HCV including co-infections among IDUs through surveillance. It is also important to note that the number of reported cases does not truly represent the actual rate of incidence since many people do not seek medical help or are unable to do so. Also, it is imperative to integrate HIV, HBV and HCV testing and treatment services within communities, to identify and treat co-infected individuals among IDUs.

Research indicates that the prevalence of HBV and HCV has been shown to increase with age, whereas HIV was lowered. Individuals with HIV were found to be at a higher risk for other infectious pathogens including HBV or HCV, which can be attributed to their shared modes of transmission. Research also indicated that both environmental and viral factors favor a more rapid spread of HCV among IDUs, whereas HIV may be somewhat slower.

To develop a sustained treatment plan, it was conclude that not only is more research needed into developing a cure but that addressing the prevention will progressively and substantially reduce the uncertainty related to the prevalence of these 3 infections. Thus prevention becomes the most crucial element in deterring individuals away from infection. Vaccinations are the first line of defense and should be administered according to the guidelines. Community clinics, local pharmacies and even high schools should have literature and information regarding the transmission and prevalence of these diseases and their impact on one's health. The information provided should detail proper syringe use, disposal and the danger of needle sharing. Bridging the knowledge gap is the first step to lower the rate of incidence, especially amongst IDUs before they are infected. Screening tests should also be implemented to identify those that are affected and have not yet been diagnosed. There is evidence to support that the criminalization of drug-use harms people seeking prevention and treatment, especially in HIV-positive individuals. Changing the policy and legislation would allow users to seek proper medical care without criminal repercussions and also allow more individuals to seek treatment thereby preventing further transmission by people who would have gone undiagnosed.

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