Original Article

Trends of coinfections among healthy blood donors: COVID-19 pandemic repercussion

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Abstract

Background: Human immunodeficiency virus (HIV), hepatitis B virus (HBV), and hepatitis C virus (HCV) coinfection has emerged as a leading cause of morbidity throughout the world in the last two decades. The coronavirus disease 2019 (COVID-19) pandemic has escalated the disease burden further by increasing the number of intravenous (IV) drug abusers and unemployment. **Aim:** The present study was done to analyse the impact of COVID-19 on seroprevalence as well as trends during pre, post and pandemic years of coinfection and mono-infections in the Malwa region of Punjab. **Setting and Design:** This descriptive cross-sectional study was done in the department of immunohematology and blood transfusion at a tertiary care hospital. **Materials and Methods:** The data on transfusion-transmitted infections (TTIs) was collected for a period of four years from 2019 to 2022, that is, pre, post and during the pandemic period. All the blood samples were screened for viral markers, HIV I and II, HCV, and hepatitis B surface antigen (HBsAg) using the enzyme-linked immunosorbent assay (ELISA) technique. Malarial antigen and syphilis infection testing was done using a rapid diagnostic card test. The total number of sero-reactive cases and their distribution were noted. **Results:** A total of 58,953 donors were screened and included during the study period. Each blood donor was identified by a donor registration number. The overall TTI seroprevalence in blood donors was 2.83% (n = 1670). The seroprevalence of TTIs in blood donors showed an increasing trend for HIV, HCV, and HBsAg in 2019–2021, whereas there was a decrease in reactivity status in the 2022 (back to pre-pandemic year). There was a significant increase in the coinfection rate from 0.1% to 0.25%. **Conclusion:** The COVID-19 pandemic impact on the coinfection rate of TTI was significant. To curb these TTIs and coinfections, education and public awareness are the key factors. India is a developing country, so transfusion medicine specialists need to work day and night to practice safe blood services.

Keywords: Coinfections, COVID-19, transfusion-transmitted infections

Introduction

Despite stringent donor screening and testing practices, safe blood, free from transfusion-transmitted infections (TTIs), remains an elusive goal. TTIs in blood donors pose a global public health problem. Hepatitis B virus (HBV), hepatitis C virus (HCV), human immunodeficiency virus (HIV), and *Treponema pallidum* still cause a high burden of diseases in many countries, especially in developing countries.[1–3]

HIV, HBV and HCV coinfection have emerged as a leading cause of morbidity throughout the world in the last two decades. Although technological advancements have led to the development of more sensitive methods to detect markers of TTIs, the problems of the 'window period', false-negative results, the prevalence of asymptomatic carriers, genetic variability in viral strains and technical errors remain.[4]

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Because of the significant burden and clinical impact of HBV in HIV-infected individuals, understanding the epidemiologic characteristics of HBV infection in HIV-infected populations among all healthcare workers, especially primary care physicians is crucial. Primary care physicians can play a considerable role in reactive donor care as they can foster the engagement of donors in the continuity of care. The prevalence of HBV infection among HIV-infected persons varies markedly, from 5% to 30% in different regions of the world.[5]

Coinfections may lead to more severe disease outcomes and quicken the disease's progression. HIV infection can accelerate the course of HBV and HCV leading to the faster development of fibrosis and cirrhosis.[6] Treatment of coinfections is associated with an increased risk of side effects due to drug-drug interactions and if treatment is aborted earlier, it leads to poor compliance as in the case of HIV/HCV treatment.[7]

The coronavirus disease 2019 (COVID-19) pandemic has escalated the disease burden further by increasing the number of intravenous (IV) drug abusers and unemployment among youth. With the advent of the COVID-19 pandemic, the adequate and safe availability of blood to meet patient needs became a significant concern in 2020 and 2021.[8] Blood centres witnessed huge challenges in recruiting blood donors, along with the risk of TTI. Knowledge about the burden of these diseases among healthy blood donors can furnish useful information on the behaviour pattern of the general population in our region.[9]

The present study was done to analyse the impact of COVID-19 on seroprevalence as well as trends during pre, post and pandemic years of coinfection and mono-infections in the Malwa region of Punjab.

Subjects and Methods

This descriptive cross-sectional study was done in the department of immunohematology and blood transfusion at a tertiary care hospital. The data on TTIs was collected retrospectively for a period of four years, from 2019 to 2022. The data were used with the permission of competent authorities. All blood donors who were eligible to donate blood and blood components as per the Drugs and Cosmetics Act, 1940, and rules, 1945 amended in 2019 who donated their blood at our blood centres during the study period were included in the study. All voluntary blood donations at blood centre and voluntary blood donation camps were included in the study.

Study methods

All the blood samples were screened for viral markers, HIV I and II (Microlisa HIV-Microwell enzyme-linked immunosorbent assay (ELISA) test by ErbaLisa), HCV (HCV Microlisa by J. Mitra), and hepatitis B surface antigen (HBsAg) (Hepalisa by J. Mitra) by using the ELISA technique. Malarial antigen testing was done using a rapid diagnostic card test (Pan Malaria card by J. Mitra) and syphilis infection was tested using a rapid card test (Serocheck TP by Zephyr Biomedicals).[10]

Statistical analysis

The total number of sero-reactive cases and their distribution were noted. Further, within the seroreactive group, cases with a combination of ≥2 TTIs were labelled as coinfections. The number, type and distribution of coinfections were noted. Data were entered using a Microsoft Excel spreadsheet and analysed. Continuous data were checked for normality and further analysed by descriptive statistics such as mean and standard deviation or median and interquartile range as appropriate. All categorical variables were expressed as frequency and percentages. One sample Chi-square test was used as appropriate to compare the difference between the time periods studied. A *P* value <0.05 was considered statistically significant.

Results

A total of 58,953 donors were screened and included during the study period. Each blood donor was identified by a donor registration number. The overall TTI seroprevalence in blood donors was 2.83% (n = 1670). Out of these, 1596/58953 (2.70%) donors were reactive for single viral marker (mono-infected), whereas 74/58953 (0.12%) donors were reactive for two or more viral markers (co-infected).

The combined TTI reactivity showed a statistically significant increase from 2.29% in the pre-pandemic period to 2.94% and 3.33% in 2020 and 2021, respectively. In 2022, the combined TTI rate was 2.41%. The *P* value was significant across the years (<0.005) [Table 1].

Figure 1 shows the month-wise distribution of overall TTI reactivity across the pre-pandemic (2019), pandemic (2020 and 2021) and post-pandemic years. Increasing trends were seen during the pandemic years.

In the present study, the overall seroprevalence of HIV, HBsAg, HCV and syphilis and their trends are shown in Table 2. The seroprevalence of TTIs in blood donors showed an increasing trend for HIV, HCV, and HBsAg in 2019–2021, whereas there was a decrease in reactivity status in 2022 (back to the pre-pandemic year).

A significant increase in HIV rates was seen from 0.15% to 0.31% from 2020 to 2021 (*P* value 0.002).

Table 1: Combined trends of TTI rates (%) across the pre-pandemic (2019), pandemic (2020, 2021) and post-pandemic (2022) years

Year	Total collection	TTI reactive	TTI rate (%)
2019	16489	378	2.29
2020	12252	360	2.94
2021	13541	451	3.33
2022	16671	407	2.41

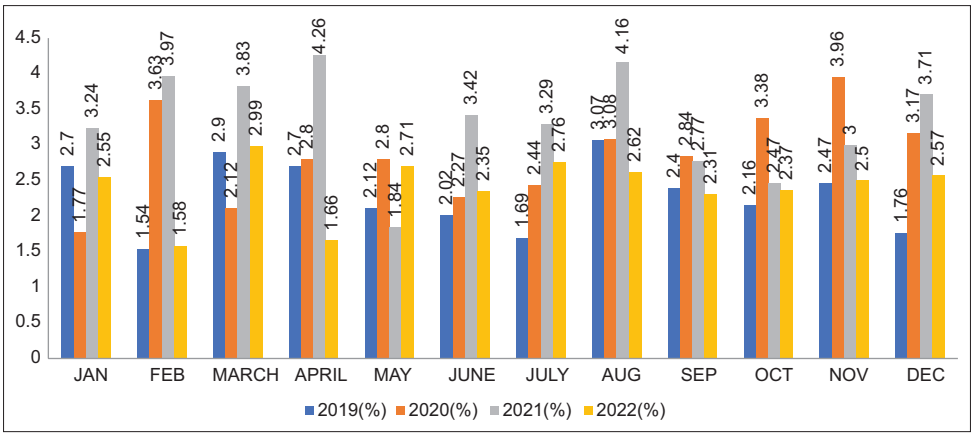

Figure 1: Month-wise distribution of TTI across the years

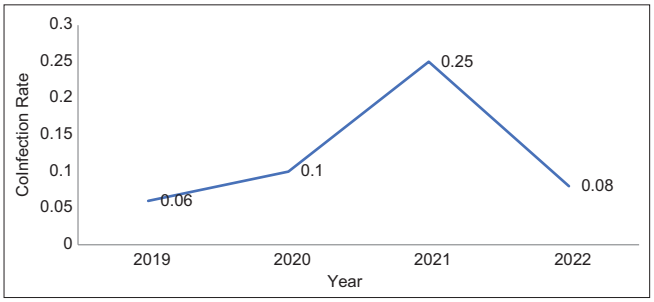

Figure 2: The trends of coinfection rates across the study period years

Coinfection rate was compared between pre-pandemic, pandemic and post-pandemic periods using the one-sample Chi-square test, which showed an increasing trend for coinfections from 2019 to 2021 and a decrease in 2022, and the difference across these years was statistically significant (*P* value < 0.05). There was a significant increase in the coinfection rate from 0.1% to 0.25% across the years [Figure 2].

The coinfection rate was compared between pre-pandemic, pandemic and post-pandemic periods for different combinations. HCV and HIV (57/74; 77.02%) were the most common coinfection seen. An increase in HCV and HIV trends was seen across the years. Significant increase (HCV and HIV) was seen from 0.06% to 0.2% in 2020 and 2021, respectively [Table 3].

Figure 3 shows month wise distribution of coinfections (HIV+HCV). There was significant increase in coinfection of HIV+HCV in 2021.

Discussion

Blood transfusion service (BTS) is an integral and dispensable part of the healthcare system. The priority objective of BTS is to ensure the safety, adequacy, accessibility and efficiency of blood supply at all levels. With every unit of blood, there is a 1% chance of transfusion-associated problems including TTIs.[11]

TTI's are a great threat to safe transfusion practices. As these infections have a common mode of transmission including a high degree of epidemiological similarity with similar routes of transmission, risk factors and higher prevalence with other sexually transmitted diseases (STDs), this favours coinfection.[12]

Worldwide, HBV, HCV and HIV account for an estimated 370 million, 130 million and 40 million cases, respectively. In HIV-infected persons, approximately 2–4 million have chronic HBV infection and 4-5 million have HCV coinfection. Syphilis is an; its presence points towards indulgence in high-risk behaviour and therefore a higher risk of exposure to infections like HIV, HBV and HCV.[13]

Analysis of the seroprevalence of TTIs among blood donors showed a significant increase in HIV, HBsAg, HCV and syphilis infections during the COVID-19 pandemic. A significant increase in prevalence was observed for HIV (0.15%) in 2020 and 0.31% in 2021, which further decreased to 0.13% in 2022, which was comparable with the pre-pandemic year in 2019 (0.10%). *P* value was significant (<0.002)

Table 2: The overall seroprevalence of HIV, HBsAg, HCV and syphilis and their trend across different years

TTI	2019	2020	2021	2022	*P*
HIV	0.10%	0.15%	0.31%	0.13%	0.002
HCV	1.59%	2.21%	2.40%	1.67%	0.042
HBsAg	0.53%	0.56%	0.62%	0.52%	0.407
Syphilis	0.030%	0.08%	0.03%	0.07%	0.012
Malaria	0	0	0	0	-

Table 3: Distribution of various coinfection among blood donors

TTI	2019 (%)	2020 (%)	2021 (%)	2022 (%)
HIV + HCV (%)	0.04	0.06	0.2	0.08
HCV + HBsAg (%)	0.01	0.08	0.02	0.005
HIV + HCV + HBsAg (%)	0.006	0.01	-	0.005
HIV + syphilis	0.006	0.01	-	-
HBsAg + HIV	-	0.01	-	-
HIV + HCV + syphilis	-	-	0.007	-

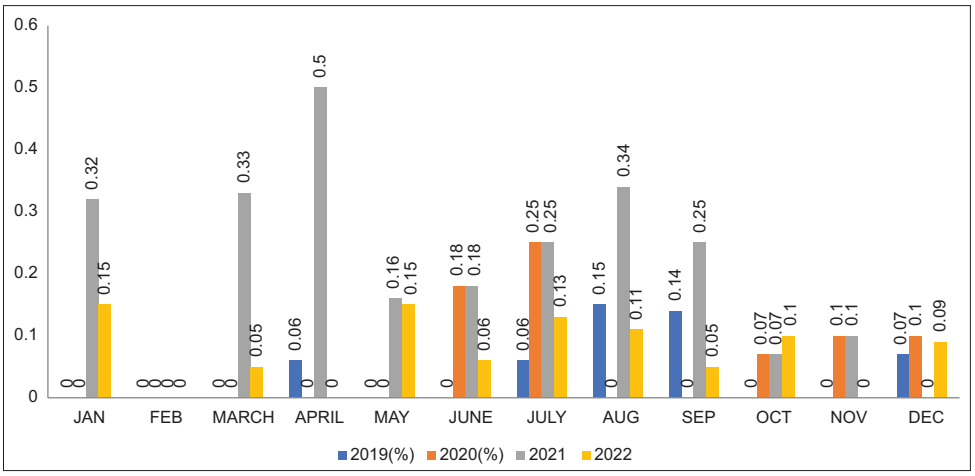

Figure 3: Month-wise distribution of coinfections (HIV+HCV) across the years

There was a significant increase in HCV prevalence from 1.59% in 2019 to 2.21% and 2.40% in 2020 and 2021, respectively. In 2022, there was a significant decrease to 1.67%. *P* value (0.02) was significant. However, there was no significant change in HBsAg and syphilis reactivity across these years. Similar results were seen in the study by Kaur P *et al.*[14]

In the current study, co-infection rate among blood donors along with the trend was also studied for periods from 2019 to 2022. 74/58953 (0.12%) donors were reactive for two or more viral markers (co-infected).

The coinfection rate was compared between pre-pandemic, pandemic and post-pandemic periods using the one-sample Chi-square test, which showed an increasing trend for coinfections from 2019 to 2021 and a decrease in 2022 and the difference across these years was statistically significant (*P* value < 0.05).

The coinfection rate was compared between pre-pandemic, pandemic and post-pandemic periods for different combinations. HCV and HIV (57/74; 77.02%) were the most common coinfection seen. An increase in HCV and HIV trends was seen across the years. Significant increase (HCV and HIV) was seen from 0.06% to 0.2% in 2020 and 2021, respectively.

In India, the first wave of COVID-19 reported in March 2020 and lasted until November 2020, again the second wave started in March 2021 that lasted till the end of May 2021. A significant difference in the coinfection rate was noted during 2020 and 2021, especially during the waves and immediately post COVID-19 waves.

Jain *et al.*[15] estimated the sero-prevalence of hepatitis virus in patients infected with HIV and found that 9.9% of patients were HBsAg positive, 6.3% were HCV positive and 1% had a dual infection with HCV and HBV.

Coinfections of the virus HCV, Hep B and HIV are due to similarities in risk factors and routes of transmission. Gender variation cannot be commented on, as only male donors were seroreactive.

In our study, coinfection of other viruses was along with the HCV, as the incidence of HCV is comparatively high in the Malwa belt due to drug addiction and quacks practice.

The risk behaviour pattern of blood donors was explored with coinfection. On donor lookback, IV drug abuse was the most common reason seen for the increasing trend of overall TTI seroprevalence and increasing coinfection rates. World Drug Report by the United Nations Office on Drugs and Crime (UNODC) in 2021 reported an increase in drug abuse due to the socio-economic impact of the COVID-19 pandemic, which is associated with stress and anxiety.[14]

Second most common reason found was unsafe sexual practices among blood donors, as the economic crisis led to stress and different behavioural changes among them.

Few authors have cautioned about an increase in deviant behaviour due to the psychological impact of the coronavirus on life and livelihood.[16,17] Further research is needed to look into the behavioural patterns of blood donors and correlate them with the prevalence of TTIs, which can be done by primary care physicians. Primary care physicians are in a perfect position to screen and diagnose substance use disorders, provide access to drug addiction therapy, and encourage positive behavioural change among the general population and blood donors.[18]

Conclusion

This study highlights the devastating effects of a pandemic on the mental status of the general population as well as on BTSs. Lockdown due to the COVID-19 pandemic led to social anxiety due to the loss of jobs and economic crisis and also mental instability due to the sudden loss of loved ones. Post COVID hike in TTIs could be attributed to IV drug abuse and behavioural changes. Comprehensive strategic frameworks are required for

the management of such kinds of pandemics. An increase in TTI led to a decrease in the healthy donor pool. A safe and healthy donor pool is the soul of BTSs. To practice safe BTSs, policies and strategies need to be revised from time to time to manage such pandemics.

Key message

We need to formulate policies to deal with pandemics pertaining to blood centres.

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Conflicts of interest

There are no conflicts of interest.

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