

TRENDS OF SYPHILIS AMONG BLOOD DONORS AT A TERTIARY CARE CENTER IN WESTERN RAJASTHAN: AN OBSERVATIONAL STUDY WITH SPECIAL REFERENCE TO THE IMPACT OF COVID-19

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ABSTRACT

Objective: This observational study aimed to determine the prevalence and trends of syphilis among blood donors at a tertiary care center in Western Rajasthan and assess the impact of the COVID-19 pandemic on testing and diagnosis rates.

Methods: The study included 208,264 blood donors who donated blood at the blood center from 2017 to 2022. The blood samples were tested for all mandatory transfusion-transmitted infections (TTIs), including syphilis. Data were analyzed using descriptive statistics.

Results: The overall seropositivity of TTIs was 1.97%, with a moderate prevalence of syphilis among blood donors. The percentage of syphilis-positive samples varied each year, with the highest percentage in 2020 (1.02%) and the lowest in 2019 (0.68%). The study found decreasing trends of syphilis prevalence among blood donors over the years. However, the percentage of positive samples in 2020 was higher than in the other years, potentially due to the impact of the COVID-19 pandemic.

Conclusion: The study provides valuable insights into the prevalence and trends of syphilis among blood donors in Western Rajasthan and the impact of the COVID-19 pandemic on testing and diagnosis rates. The findings may inform strategies for maintaining access to sexual and reproductive health services during times of crisis, as well as for the prevention and control of syphilis in the region.

Keywords: Syphilis, COVID-19, Transfusion-transmitted infection, Blood donor.

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INTRODUCTION

Syphilis is a bacterial infection caused by the spirochete bacterium *Treponema pallidum* that can be transmitted by sexual contact or blood transfusion [1]. Syphilis, if left untreated, can cause significant health issues such as blindness, neurological impairment, and death. With a reported frequency of 0.3–3.4% [2] among the general population, syphilis is a major public health concern in India.

Blood transfusions are a vital component of health-care systems around the world, and screening donated blood for the presence of pathogens is critical to preventing the spread of diseases like syphilis. The National Blood Transfusion Council in India has set blood screening guidelines and requires syphilis testing as part of the routine blood screening process [3].

Rajasthan is a western Indian state with a population of about 82 million people [4] and a high prevalence of infectious diseases such as syphilis. Unfortunately, data on syphilis prevalence among blood donors in Rajasthan are sparse, and additional study is needed to better understand the prevalence of syphilis among blood donors in the state.

Furthermore, the COVID-19 pandemic has disrupted health-care systems globally and impacted the provision of essential health services, including sexual and reproductive health services [5]. The fear of infection by severe acute respiratory syndrome coronavirus 2 has reduced patients visit to the clinic during the pandemic. The pandemic of COVID-19 has had a profound influence on world health, the economy, and social life. Among the many harmed fields, the field of sexually transmitted infections (STIs) has not been spared. Knowing the pandemic's influence on STIs is critical for future management and

prevention of these infections [6]. The pandemic has also affected the diagnosis and treatment of STIs, leading to concerns about the potential impact of the pandemic on the prevalence of syphilis and other STIs [7].

Therefore, this observational study aims to assess the prevalence and trends of syphilis among blood donors at a tertiary care center in western Rajasthan, with a special reference to the impact of COVID-19 on testing and diagnosis rates.

The results of this study will provide important insights into the prevalence and trends of syphilis among blood donors in Western Rajasthan and the impact of the pandemic on its testing and diagnosis rates. The findings will have implications for the prevention and control of syphilis in the region and may inform strategies for maintaining access to sexual and reproductive health services during times of crisis.

METHODS

Study design

This study is an observational retrospective study conducted at the Department of Immunohaematology and Transfusion Medicine, at a tertiary care center in Western Rajasthan which is one of the largest healthcare facilities in the region, to determine the prevalence and trends of syphilis among blood donors and to assess the impact of the COVID-19 pandemic on syphilis testing and diagnosis rates.

Study population

The study population comprised of 2,08,264 blood donors who donated blood at the tertiary care center during the study period from 2017 to 2022 (6 years). The study included all blood donors who donated blood and provided written informed consent to participate in the study.

Data collection

About 3 mL of blood samples were collected in pilot test tubes at the time of bleeding from all blood donors who donated blood and screened for all mandatory transfusion-transmitted infections (TTIs) including syphilis using the Rapid Card Test or rapid plasma reagin (RPR) test. All these tests were performed by trained personnel under supervision of medical officer in well-equipped TTI laboratory at the Blood Center, and the standard protocol prescribed by the manufacturer of the test kits was followed strictly. Positive blood units were discarded according to standard Protocol. Seropositive donors were contacted telephonically and through a confidential letter for counseling and later advised to consult in Skin and Venereal disease and STD Clinic in the same hospital for further management.

Data analysis

Data were entered into a spreadsheet and analyzed using descriptive statistics to determine the prevalence and trends of syphilis among blood donors. The prevalence of syphilis was calculated as the number of blood donors testing positive for syphilis divided by the total number of blood donors tested.

Ethical considerations

The study has been approved by the Institutional Ethics/Research Committee of the tertiary care center. All participants were provided written informed consent before participation in the study. Confidentiality of participant information was maintained throughout the study.

RESULTS

This study was conducted on 2,08,264 blood donors who donated blood at our Blood Center and screened for mandatory testing of TTIs. The total number of blood donations has increased each year, except in 2020 (27450), with the highest number of donations in 2022 (45,304) (Table 1).

Overall seropositivity of TTI was 4,116 (1.97%) out of 2,08,264 blood donors (Table 2).

The percentage of syphilis-positive samples has varied each year, in 2017 (0.92%), 2018 (0.79%), 2019 (0.68%), 2020 (1.02%), 2021 (0.94%), and 2022 (0.84%) out of total blood donors. The percentage of syphilis-positive samples was the highest percentage in 2020 (1.02%) and the lowest in 2019 (0.68%) (Table 3).

Trends of overall sSeropositivity have decreased over the years with a significant increase in 2020 (2.13%) due to the impact of COVID-19. Overall contribution of syphilis to total seropositivity was 1796 (43.63%) out of 4116 total reactive donors. The findings of the study suggest a moderate prevalence of syphilis among blood donors and decreasing trends with a significant increase observed in 2020 (1.02%) compared to previous years. However, it is interesting to note that the percentage of positive samples in 2020 was higher than in the other years, which could potentially be attributed to the impact of the COVID-19 pandemic (Table 4).

Overall, the results suggest that the prevalence of syphilis among blood donors at this tertiary care center in Western Rajasthan has remained relatively stable over the years, with some fluctuations in the number of positive samples and the percentage of positive samples. However, further research may be needed to investigate the potential impact of the COVID-19 pandemic on the prevalence of syphilis among blood donors.

DISCUSSION

The COVID-19 pandemic has led to significant changes in the prevalence and trends of STIs, including syphilis, globally. This study aimed to examine the prevalence and trends of syphilis among blood donors at a tertiary care center in Western Rajasthan and its association

Table 1: Gender-wise distribution of total blood donors

Year	Male	Female	Total blood donor
2017	28999	357	29356
2018	33807	436	34243
2019	34141	479	34620
2020	27264	186	27450
2021	36887	404	37291
2022	45123	181	45304
Total	206221 (99.02%)	2043 (0.98%)	208264

Table 2: Year-wise distribution of total reactive TTIs in blood donors

Year	Total blood donor	Total reactive	%
2017	29356	641	2.18
2018	34243	680	1.98
2019	34620	647	1.86
2020	27450	585	2.13
2021	37291	740	1.98
2022	45304	823	1.81
Total	208264	4116	1.97

Table 3: Year-wise distribution of syphilis reactivity out of total blood donors

Year	Total blood donor	Syphilis	%
2017	29356	273	0.92
2018	34243	273	0.79
2019	34620	236	0.68
2020	27450	282	1.02
2021	37291	351	0.94
2022	45304	381	0.84
Total	208264	1796	0.86

Table 4: Year-wise distribution of syphilis reactivity out of total reactive blood donors

Year	Total reactive	Syphilis	%
2017	641	273	42.58
2018	680	273	40.14
2019	647	236	36.47
2020	585	282	48.20
2021	740	351	47.43
2022	823	381	46.29
Total	4116	1796	43.63

with the COVID-19 pandemic. When compared with previous studies, the results of this study show a decreasing trend in syphilis positivity rates among blood donors from 0.92% in 2017 to 0.84% in 2022 with a significant increase observed in 2020 compared to previous years. This is consistent with other studies conducted during the pandemic period, which have found an increase in syphilis cases.

A study by Rodríguez and Hernández [8] in Cuba found that the pandemic has had a significant impact on the prevalence and incidence of STIs, including syphilis and gonorrhoea. The study showed a significant increase in syphilis and gonorrhoea cases during the pandemic period, which could be attributed to the disruption of healthcare services and changes in sexual behavior. Similarly, a study by Nazir *et al.* [9] in the USA found a surge in syphilis cases during the pandemic, suggesting that the pandemic may have led to an increase in risky sexual behavior and reduced access to healthcare services.

In India, a study by Kumari [10] examined the prevalence and trends of infectious disease markers among blood donors in a regional

transfusion center in Punjab. The study found that the prevalence of syphilis was relatively low but showed a significant increase over time. However, the study did not specifically examine the impact of the COVID-19 pandemic on the prevalence of syphilis.

In a study by Pokhrel *et al.* conducted in Northern India, the authors evaluated the trends of infectious disease markers among healthy blood donors over a period of 10 years (2006–2015) [11]. The authors reported a decreasing trend in the prevalence of syphilis among blood donors, with the prevalence dropping from 0.51% in 2006 to 0.09% in 2015. The authors attributed the decreasing trend to increased awareness and stringent donor screening measures implemented by blood banks.

A study by Keebayoon and Wiwanitkit [12] described a case of secondary syphilis in a patient who received a COVID-19 vaccine. The study suggested that the vaccination could have triggered the patient's immune response, leading to the development of secondary syphilis. However, this is an isolated case, and further research is needed to examine the potential association between COVID-19 vaccination and syphilis.

Studies conducted in Taiwan by Chia *et al.* [13] during the pandemic period reported a significant decrease in the number of syphilis diagnoses. This may be attributed to the lockdown measures implemented in Taiwan, which led to a reduction in risky sexual behavior. Similarly, a study by Bonato *et al.* [14] in Italy found a significant reduction in syphilis cases during the lockdown period, suggesting that the pandemic may have led to reduced sexual activity and increased awareness of the importance of preventive measures.

Belgrade did a cross-sectional study that compares syphilis incidence during the COVID-19 pandemic to data from the preceding year. The researchers gathered information from syphilis patients who visited the Belgrade Center for Skin and Venereal Diseases between January and August 2019 and 2020. The scientists discovered that the number of syphilis cases in 2020 was greater than in 2019, implying that the COVID-19 pandemic may have had an impact on the syphilis epidemiology in Belgrade similar to the present study [15].

A study by Stanford *et al.* in the United States evaluated data from 2018 to 2020 and discovered a 61% rise in syphilis infections during the pandemic versus the preceding 2 years. The study explained this increase to the pandemic's interruption in healthcare access and limited access to preventive interventions. While both studies found an increase in syphilis prevalence during the pandemic, the Stanford *et al.* study found a higher rise in cases than the present study [16].

The reasons for the increase in syphilis cases after the COVID-19 pandemic are complex and likely multifactorial. One possible explanation is that the pandemic and associated lockdowns led to changes in sexual behavior that increased the risk of syphilis transmission. People may have had fewer sexual partners during the initial phases of the pandemic, but as restrictions were lifted and people began socializing more, they may have engaged in riskier sexual behaviors that increased the likelihood of syphilis transmission.

Another possible factor is the disruption to healthcare systems and decreased access to sexual and reproductive health services during the pandemic. Many clinics and health centers were forced to limit their services or close entirely, which may have led to fewer opportunities for syphilis testing and treatment. This may have resulted in undiagnosed and untreated cases of syphilis that continued to spread within the population.

In addition, the stress and anxiety associated with the pandemic may have had an impact on sexual behavior and contributed to an increase in syphilis cases. Research has shown that stress and anxiety can affect

sexual behavior, leading to riskier sexual practices and an increased likelihood of STIs.

The complex and multifactorial nature of the COVID-19 pandemic and its impact on sexual behavior and health-care systems make it difficult to determine the exact reasons for the increase in syphilis cases. However, it is clear that maintaining access to sexual and reproductive health services during times of crisis is essential to preventing and controlling the spread of STIs, including syphilis.

Overall, the findings from these studies suggest that the prevalence of syphilis among blood donors varies depending on the geographical location, screening algorithm, and testing methods used. While some studies have reported a decreasing trend in the prevalence of syphilis among blood donors, some other studies have reported an increasing trend. Our study has reported a decreasing trend in the prevalence of syphilis among blood donors and a significant increase observed in 2020 compared to previous years. It is important for blood centers to implement stringent donor screening measures and utilize sensitive and specific testing methods to ensure the safety of blood products. The impact of the COVID-19 pandemic on the prevalence of syphilis among blood donors is still unclear and requires further investigation.

Limitations

First, the study population comprises blood donors who may not be representative of the general population.

Second the study is limited by the RPR test used, which may produce false-positive results.

CONCLUSION

This study aimed to determine the prevalence and trends of syphilis among blood donors at a tertiary care center in Western Rajasthan, with special reference to the impact of COVID-19. The findings of the study suggest a moderate prevalence of syphilis among blood donors and decreasing trends with a significant increase observed in 2020 compared to previous years. The COVID-19 pandemic appears to have a significant impact on the prevalence of syphilis among blood donors, as the prevalence was increased compared to previous years.

The study's limitations include its retrospective design, which may have limited the availability of information regarding potential risk factors for syphilis, as well as the limited geographic scope of the study. Future studies could expand on this research by including more diverse populations and exploring the potential impact of other factors, such as sexual behavior and access to healthcare, on syphilis prevalence.

Comparison of the study's results with other studies revealed that the prevalence of syphilis varies widely across regions and populations. Some studies have reported an increase in syphilis cases during the COVID-19 pandemic, while others have found no significant impact. This suggests that the impact of the COVID-19 pandemic on syphilis prevalence is complex and multifaceted, and may be influenced by a range of factors, including changes in sexual behavior, access to healthcare, and public health interventions.

Overall, the findings of this study provide valuable insights into the prevalence of syphilis among blood donors in Western Rajasthan and highlight the ongoing need for robust screening and prevention efforts. By improving our understanding of the epidemiology of syphilis, we can develop more effective strategies for reducing the burden of this disease and improving public health outcomes.

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AUTHORS' CONTRIBUTION

All the authors have contributed equally.

CONFLICTS OF INTEREST

The authors declare no conflicts of interest.

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