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SYPHILIS PREVALENCE AND ITS CO-INFECTION WITH HBV, HCV, AND HIV AMONG HEALTHY BLOOD DONORS AT A TERTIARY CARE CENTER.

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ABSTRACT

BACKGROUND: Blood transfusion has a therapeutic role in reducing morbidity and mortality. However, there is a risk for the recipient of acquiring TTIs, so it is crucial to have data regarding the prevalence of these TTIs and to have strict strategies to reduce their transmission. **OBJECTIVE:** To determine the prevalence of syphilis and its co-infection with HBV, HCV, and HIV among healthy blood donors. To find out the association of syphilis with different age groups. **DESIGN:** A descriptive study with non-probability, consecutive sampling. **PLACE of study**: Blood Bank, Jinnah Postgraduate Medical Centre, Karachi. **DURATION OF STUDY:** January 2021 to December 2022 **METHODOLOGY:** All blood donors who fulfilled standard departmental blood donation selection criteria and consented were included in the study. Using an aseptic technique, the serum blood sample was taken from blood donors. Serological tests for HBsAg, Anti-HCV, HIV antigen-antibody combination, and syphilis were analyzed by an automated chemiluminescent microparticle immunoassay (CMIA) method. **RESULTS:** The study included a total of 48,731 blood donors. The mean age was 29.5±8.56 years (range 18-65). The prevalence of syphilis positivity was seen in 1125(2.3%) cases. According to age groups, it was most prevalent in 18 to 32 years in 638(1.3%), then in 48- 65 years, which was found in 404(0. 8%), whereas it was least prevalent in the middle age group and accounted for 83(0.2%). The co-infection of syphilis with HBV, HCV, and HIV was also reported in 20 (1.8%), 32 (2.8%), and 07 (0.6%) cases, respectively. **CONCLUSION**: Syphilis was found in 2.3% of healthy blood donors. The study proposes to impose strict measures to control the spread of syphilis and co-infection with other TTIs.

KEYWORDS: Co-infection; syphilis, seropositive blood donor.

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INTRODUCTION

Blood transfusion has a therapeutic role in reducing morbidity and mortality in many medical conditions like major hemorrhage, obstetric and surgical emergencies, bone marrow failure syndrome, cancer, and maintaining hemoglobin in patients suffering from hemoglobinopathies. However, for the recipient, there is a risk of acquiring TTIs unless the focus is on a safe blood supply. It includes adherence to a strict policy, detailed history, and appropriate donor selection, deferral of blood donors who aren't eligible for blood donation, proper screening, and appropriate temperature for storage to minimize TTIs-related hazards[1]. The poor quality of

transfusion practices causes more infectious disease burden in developing countries and is of great concern. Unfortunately, the exact burden of these infections is not available in many developing countries. Among TTIs, syphilis causes significant morbidity, especially in young individuals.

Apparently, healthy blood donors are a low-risk group for infection transmission, but they may be asymptomatic carriers and become a causative agent for infection transmission. The causative organism of syphilis is the bacterium Treponema pallidum[2]. Despite advancements in the management of syphilis, transmission of infection remains a matter of concern in blood donors. Syphilis is primarily transmitted through sexual contact, but it can be transmitted via blood, mainly in later or active stages, although it is rare through blood transfusion, but remains a potential risk if not properly screened. Transmission of Syphilis is a health problem in populations who have multiple partners, are poor, and are intravenous drug abusers, share cosmetic or surgical instruments, and particularly homosexual men[3]. Because of their latent state or prolonged viremia, their transmission in the carrier state is a continuous health risk. According to the World Health Organization (WHO) report, 8 million people aged

15 to 49 years had syphilis in 2022, and most were asymptomatic[4]. Around 0.5% of males are acquiring syphilis in the general population[5]. The prevalence of syphilis has been declining, whereas in developing countries it's rising.

Syphilis has primary, secondary, tertiary, and latent stages. The antibodies to syphilis may be a result of a previous infection, or a nonspecific or latent stage. Early diagnosis and treatment reduce progression to complications and decrease the risk of transmission. WHO recommends nonspecific tests (Rapid Plasma Reagin and Venereal Disease Reference Laboratory as screening tests) and specific tests (Treponema pallidum Haemagglutination Assay and the Enzyme Immunoassay)[6]

Syphilis co-infection with HBV, HCV, and HIV has emerged as a significant cause of morbidity and mortality globally[7]. It becomes more lethal when associated with HIV[8,9]. HIV is a retrovirus that compromises the immune system of the host and leads to acquired immunodeficiency syndrome (AIDS)[8]. HBV is a highly contagious DNA virus that infects hepatic cells which causing chronic liver disease and leading to liver failure and liver cirrhosis. HCV is an RNA virus that also causes chronic liver disease and leads to liver failure, liver cirrhosis.

Identifying co-infection is important because the same route of infection transmission may suggest the same preventive actions[9]. Co-infection can also complicate the outcome of the disease. Infection International data shows coinfection variations in co-infection rates, however, we have a paucity of data from Pakistan[10]. So, this study will help obtain local data on the syphilis co-infection rate. Many individuals are unaware of their health status, and they come to know first time after screening results. This study also focuses on the use of improved screening methods.

This study aims to highlight the prevalence of syphilis and also the co-infection rate of HBV, HCV, and HIV among blood donors. Data on disease burden among healthy blood donors is a reflection of the disease carrier rate in the general population.

MATERAIL AND METHODS

A total of 48,731 blood donors were enrolled in the study. It was conducted from January 2021 to December 2022 at Jinnah Postgraduate Medical Centre (JPMC), Karachi. A descriptive study with non-probability, consecutive sampling was carried out after approval of the Institutional Review Board (IRB). All blood donors aged 18-65, who fulfilled standard departmental blood donation selection criteria and donor history questionnaire, physical examination, complete blood counts, and consent, were

eligible to enroll in the study. Blood donors who didn't meet standard departmental blood donation selection criteria like age less than 18 or more than 65 years), body weight (less than 50 kg), hemoglobin level(less than 12 g/dl, history of any dental procedure or fever in the previous week, history of malaria in last three years, positive history of HIV, Hepatitis C, Hepatitis B infection, intravenous drug abusers, vaccination history in the previous 4 weeks and history of extramarital sexual relationship and homosexuality were excluded from the study.

Around 6 ml of blood sample was taken for serological tests using aseptic techniques from blood donors. Serum for HBsAg, Anti-HCV, HIV antigen-antibody combination, and syphilis were analyzed by an automated chemiluminescent microparticle immunoassay (CMIA) method on Architect i2000 (Abbott Diagnostic, USA) within 2 hours of collection of the sample. Quality control was ensured by running negative and positive controls with each batch.

SPSS version 20 was used to analyze data. Blood donors were categorized into age groups according to 18- 32 years, 33-47 years, and 48- 65 years. Percentages and frequencies were calculated for categorical data. Chi-square/ Fisher's exact test was applied to get the association of syphilis with HIV, HCV, and HBV, and also the association of syphilis with age groups. The p-value ≤0.05 was considered significant.

RESULTS

The study included a total of 48,731 blood donors. The mean age was 29.5±8.56 years (range 18-65). The prevalence of syphilis positivity was 1125(2.3%), as shown in Figure 1. According to age groups, it was most prevalent in 18 to 32 years, which was 638(1.3%), then in 48- 65 years, which was 404(0. 8%), whereas it was least prevalent in the middle age group and accounted for 83(0.2%). The association between syphilis and age groups was significant, and □ value was 0.00, which was significant as shown in Table 1.

The co-infection of syphilis with HBV, HCV, and HIV was also reported in 20(1.8%), 32 (2.8%), and 07 (0.6%) cases, respectively, which shows the highest with HIV as shown in Table 2

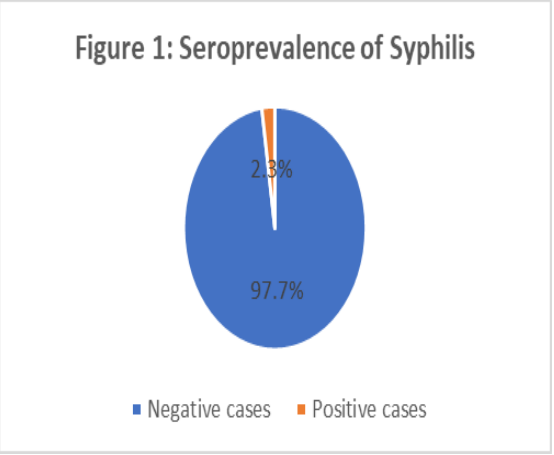

TABLE 1: Association of Syphilis with Different Age Groups

	Syphilis Positive	Syphilis Negative	P-Value
Age_Groups 18-32	638 (1.3%)	29338 (60.2%)	0.000
33-47	83 (0.2%)	18142 (37.2%)	
48-65	404 (0.8%)	126 (0.26%)	
TOTAL	1125 (2.3%)	47606 (97.7%)	

The chi-square test was used. The p-value <0.05 was taken as significant.

TABLE 2: Co-infection of Syphilis with HBV, HCV, and HIV

	Syphilis Positive	Negative	P-Value
Hbv Positive	20	1289	0.35
Negative	1105	46317	
Hcv Positive	32	1506	0.30
Negative	1093	46100	
Hiv Positive	7	59	.001
Negative	1118	47547	

Fisher's exact test was applied. The p- value <0.05 was taken as significant.

DISCUSSION

Blood transfusion is one of the lifesaving therapies. Although blood donors are routinely screened for transfusion-transmitted infections, even then, they carry the risk of transferring infections through asymptomatic carriers. Complying with standards of procedures from a selection of eligible donors, screening of blood, proper storage, to vigilant administration of blood should be followed. Reactive donors should be reported to the concerned authority, and the reactive donors should be referred to specialists for further testing, counseling, and treatment. The provision of safe blood is the utmost goal of blood transfusion services. Despite being a treatable disease, syphilis is still a health concern as it circulates in the population, and many times, asymptomatic carriers transmit the disease. The prevalence of syphilis in our study was 1125(2.3%). A high prevalence might be because of a lack of awareness, unhealthy lifestyles, unsafe sexual practices, and a lack of availability of health services. The studies conducted in Islamabad showed 0.8%, blood donors were syphilis positive, and studies from northern areas showed 0.9% and 1.1%, respectively [11,12,13]. According to the author, most of the blood donors were educated with high levels of awareness regarding public health, healthy lifestyle, and belonging to urban areas which influenced the low frequency of syphilis in this population[11,12,13]. Whereas, when we focused on international literature, we got differences in percentages, like in many African countries, it was found high prevalence, as reported in a Study conducted in Angola, which was 20%, and in Zambia at 40.5%[14, 15]. In developed countries, there is a low number of positivity like 1.18/per 10,000 donations in France and 0.38 per 10,000 in the United Kingdom[16,17]. Many factors cause differences in prevalence in developed and developing/ underdeveloped countries like awareness of public health, free access to healthcare facilities, using more sensitive methods for screening, early recognition of carrier state by molecular techniques, and provision of treatment with regular follow-ups. According to age groups, syphilis was most prevalent (1.3%) among 18 to 32-year-olds, then in 48- to 65-year-olds, which was 0.8%, whereas it was least prevalent in the middle age group, which was 0.2%. It is an interesting finding that it was more prevalent in the elderly than middle-aged. Many of these individuals use medications for sexual dysfunction or engage in risky behavior. Similar results were seen in previous studies and were most frequent in younger age groups[12,14]. It is one of the few studies that highlight the association of syphilis with different age groups. Globally, co-infection with HIV is relatively more common. Syphilis might increase the susceptibility of the mucosa to HIV acquisition. As HIV causes immunosuppression, so risk of syphilis reactivation is high. In syphilis-infected individuals, co-infection with HBV, HCV, and HIV was reported in 20 (1.8%), 32 (2.8%), and 07 (0.6%) cases, respectively. Karabaev et al. documented syphilis with HBV in 69 (6.0%), syphilis with HCV in 56 (4.9%), syphilis with HIV in 10 (0.87%)[18]. Results from studies conducted in India were not highly consistent with ours, which were shown in the following results. Chhattisgarh's study showed syphilis with hepatitis B in 3.7%, followed by HIV co-infection in 2.9%[19]. However, the study from South India reported co-infection of syphilis and HBV in 1 (5%), and with HIV in 2 (10%)[20]. The results endorsed by the literature that HIV and Syphilis co-infection was 1.7%[21].

The vulnerable population for acquiring HCV, HIV, and syphilis is the same, as these infections have the same route of transmission. Individuals having co-infection needspecial attention for treatment success, as they are at risk of developing side effects of therapy and a lack of compliance. These groups need special attention to prevent the further spread of infections and to improve therapy success by monitoring them regularly, as they are at a higher risk of developing adverse medication effects and

severe liver complications[22]. Screening of blood donors and identification of the risk of co-infection with other TTIs contributes to the provision of better health outcomes. Many times, blood donors look healthy, and they deny any past exposure. In these cases, an extensive history and deferral at the initial stage may be helpful. Prompt detection and treatment of co-infection is important both for donor health and recipient safety.

CONCLUSION

Syphilis is a great concern for transfusion services. The study proposes to impose strict measures to control the spread of syphilis and co-infection with other TTIs. This includes stringently following donor criteria and excluding high-risk individuals, using highly sensitive and specific methods for screening, carrier detection in the window period, and rational use of blood and its components. In addition, if an individual is found positive, counseling, health education, and referral to the concerned department.

ETHICS APPROVAL: The ERC gave ethical review approval. IRB/2019-GEN/10044/JPMC.

CONSENT TO PARTICIPATE: written and verbal consent was taken from subjects and next of kin.

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CONFLICT OF INTEREST: No competing interest declared

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