Seroprevalence of Syphilis among Iraq's Blood Donors and Their Relation with Blood Group and Rh Factor

Suad Azeez Hassan[1], Eman S. Nassir[2], Aseel I. Ibrahim[1], Luma Tareq[3]

[1]Lecturer, [2]Assistant Lecturer, Clinical Laboratory Science Department/ College of Pharmacy/ University of Baghdad/Iraq, [3]Senior Statistician Chief, College of management and economic / Mustansiriyah university /Iraq

Abstract

Aim of Study: to detect the frequency of syphilis disease among healthy blood donors and if there's association with ABO Blood groups and Rh factor.

Methods and Material: this study performed in Iraq National Blood transfusion in Baghdad city, collection of blood samples obtained from apparently healthy blood donors for a 12 month period (Jan.2018 toDec.2018). Blood group for the volunteers was determined by forward and revers grouping method. Detection of syphilis performed by using ELISA technique (fortress,BXE0995C, united Kingdom) for detect antibodies in the human serum. Syphilis test on of the routine test applied in the blood donor bank in Iraq.

Result: a total of 178966 healthy volunteers included in the study, all were blood donors, age 18-60 years, with mean age of 39 years. Only 1233 (0.69%) appeared infected with syphilis, 1208 (98%) were males while 25(2%) were females; 444(36%) seropositive was blood group A, while blood group O and blood group B seropositivity was 366(29.7%) , 333(37%) respectively, The lowest percentage recorded for blood group AB at 90(7.3%). The prevalence of syphilis with Rh factor was as following: 1147(93%) of seropositive was Rh +ve whereas 86(7%) was Rh -ve. **Conclusion**: blood group A and O are the most prominent blood groups among voluntary donors and the prevalence of syphilis is equal compared with other countries.

Key word: *Treponema pallidum, syphilis, blood group, blood donors*

Introduction

Blood transfusion is one of the potential risk factors for transmission of various blood transmitted pathogens, such as hepatitis B virus (HBV), human immunodeficiency virus (HIV), hepatitis C virus (HCV) and syphilis.[1] For this reason these tests are done in Blood Bank to avoid dissemination of infectious diseases. The tests performed on blood donation are necessary, not only for compatibility but also to prevent distribution of blood-borne pathogens. Compatibility It is one way to limit posttransfusion adverse events and to phenotype blood donors for red blood cell group system. Infectious tests aim to detect transfusion-transmitted infections, syphilis is one of them.[2]As per World Health Organization (WHO), there are 39 countries where routine screening tests are not performed during blood donation from which HIV, HCV, HBV, and other transfusiontransmitted infections, and 47% of already donated blood were examined without quality assurance in laboratories.[3] Blood group and compatibility test were done to explain the relationship between infectious diseases and red blood cell antigens.[4]

Syphilis is one of the sexually transmitted disease (STD), caused by *Treponema pallidum* bacteria, it is a chronic disease with multistages,[5] it is transmitted also to the baby by the mother during pregnancy or birth, resulting in congenital syphilis which could cause damage to body systems (nervous, skeletal, skin, mucous membrane), it also could result in abortion and still birth.[6]Other mode of transmission of syphilis is blood transfusion and

Corresponding author:
Suad Azeez Hassan
E-mail: darkknight_1945@yahoo.com

accidental direct inoculation.[7]Currently rhinoplasty, injection, laser, razor reuse, ear piercing, tattoos, liposuction, and sometimes the condom increased the incidence of transmission greatly,[8,9]17.27% of college students were reported to have a history of cosmetic surgery such as rhinoplasty, and 69.4% reported that they would undergo such surgery without consideration of economic factors.[10,11,12] In 2011 the WHO reported 12 million new cases of syphilis.[13]The fact that *T.palladium* cannot survive in properly stored blood, makes it essential to ensure safety transfusion in Oder to protect human lives.[14]Red blood cell surface contains different blood group antigens which is composed of polysaccharides and proteins,[15]ABO and Rh factor are most important ones among these antigens.[16] In the last decades many studies probed the association of blood groups and some infectious diseases.[17]Many studies illustrated the association between specific blood group antigens and pancreatic cancer risk.[18,19,20] Other studies demonstrated the association of ABO system with malaria, cerebral thrombosis and ovarian cancer.[21,22,23]Some blood groups can represent a receptor and ligand for specific types of bacteria, parasites, and viruses. Interaction of these certain types of microorganisms and RBC membrane could be due to antigenic resemblance, adherence through specific receptors or modulation of antibody response.[24] Limited inaccurate data available on the prevalence and epidemiology of syphilis in Iraq showing the association between blood groups and frequency of syphilis. The aim of this study is to investigate the prevalence of syphilis in Iraqi blood donors mainly,Baghdad province referred to Iraq National Blood Bank and to determine the association between blood groups and syphilis infection.

Methods and Materials

This study conducted in Iraqi National Blood Bank in Baghdad city. Syphilis detected by Enzyme-linked immune sorbent assay (ELISA) technique (fortress,BXE0995C, united Kingdom) following manufacturer's instructions to detect the presence of antibodies against syphilis in the serum of human. Blood samples collected from the volunteers Jan. 2018 continue to Dec. 2018. All volunteers were screened for routine infectious tests: HIV, HCV, HBV, HBsAg, in addition to syphilis.

Blood donors: 178966 blood donors recruited for the study**,** all the donors are apparently

healthy and do not suffer from any impairment. Their age ranges between 18-60 years. Venous blood was collected and directly performed in Iraqi National Blood Bank, medical history from each volunteer was taken.

Determination of blood group: Blood groups were determined by forward grouping (cell grouping) using a known monoclonal monospecific antisera: Anti-A, Anti-B, and Anti-D to determine antigen expressed, and revers grouping (serum grouping) using known A&B cell to determine the presence of antibody by test tube agglutination method.

Statistical analysis: Data of the study analyzed by SPSS version 25. With probability $P<0.05$. Chi-square used to determine significant differences among blood donors.

Result

The study included 178966 blood donors, with age between 18-60 year with mean age of 39. Seropositive of syphilis appeared in 1233 (0.69%) only. Number of seropositive males was 1208 (98%) while 25(2%) were females, as shown in table (1), from which 444(36%) seropositive with blood group A, 333(37%) seropositive with blood group B, 366(29.7%) seropositive with blood group O, and 90(7.3%) seropositive with blood group AB, as illustrated in table (2) and figure (1). Relation of seropositive syphilis with Rh was as follow: 1147(93%) of seropositive was Rh+ and 86(7%) was Rh-, as demonstrated in table (3).

Table-1- Seroprevalence of syphilis among blood donors, and their relation with sex, for each month within 2018 year.

	Numbers of donors	Seropositive of syphilis (%)	Male (%)	Female (%)
January	15406	115	113	2
February	13714	103	101	2
March	16497	129	128	1
April	13939	87	87	0
May	15235	114	113	1
Jun	12333	88	87	1
July	15401	106	103	3
August	15482	87	83	4
September	15946	106	103	3
October	15331	102	99	3
November	15372	84	84	0
December	14310	112	107	5
Sum.	178966	1233(0.69%)	1208 (98%)	25 (2%)

Table-2- Seroprevalence of syphilis infection among blood donors according to their blood group.

Blood group	No. of seropositive	Ratio of donors (%)
A	444	36
B	333	37
O	366	29.7
AB	90	7.3
Sum.	1233	100

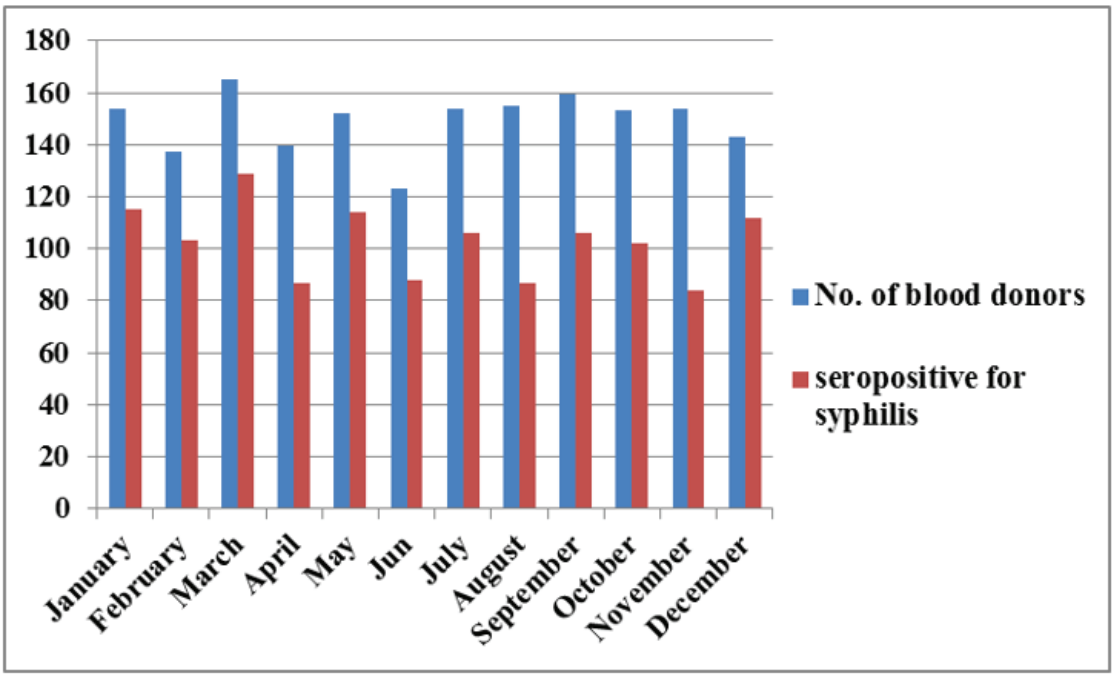

Figure (1): shown the numbers of blood donors each month within 2018, and numbers syphilis infections.

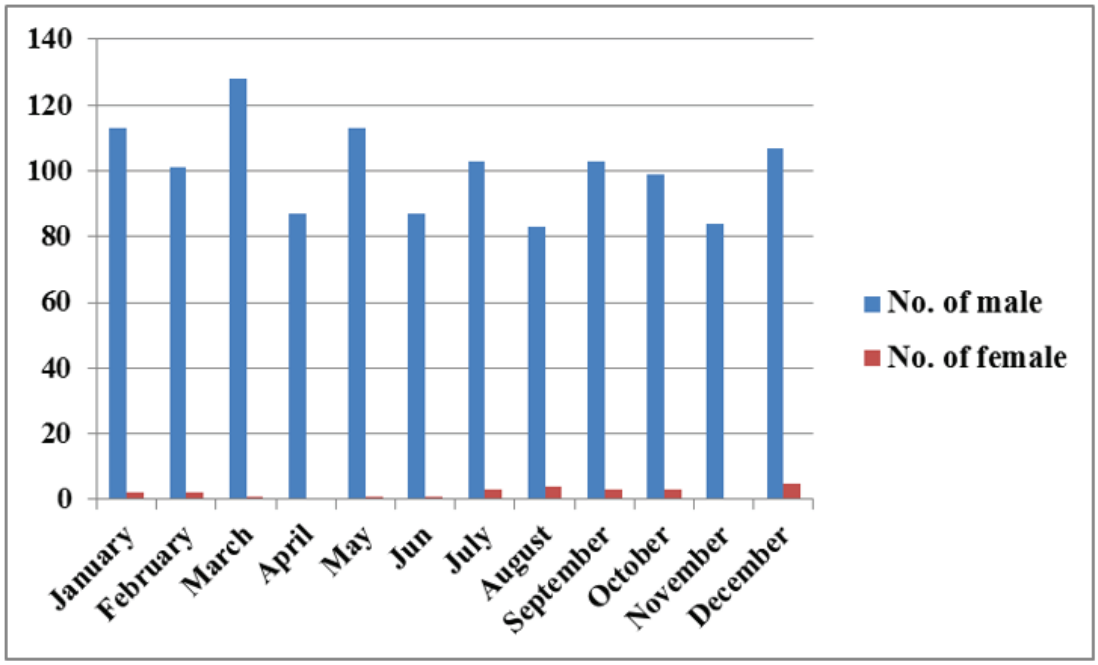

Figure (2): shown the numbers of infected male and female with syphilis each month within 2018 year

Table-3- Seroprevalence of syphilis among blood donors according to Rh.

Rh	No. of seropositive	Ratio of seropositive (%)
Rh+	1147	93
Rh-	86	7
Sum.	1233	100

Statistical analysis for this data performed by SPSS software (version 25), chi square was 227.117[a], and Asymp sig. were .000 appeared significant differences among blood donors seropositive to syphilis according to the blood group.

Discussion

This study was conducted in Iraq to correlate between syphilis and blood groups. our study performed in Baghdad province, Iraqi National Blood Transfusion Bank lies in Baghdad city/Bab-Al Muadham.

It was found that 1233(0.69%) blood donors are infected with syphilis, this ratio is approximate to that found in Al-Nasiriya province (south of Iraqi) out of 28287 blood donors there was 200(0.71%) infected with syphilis.[25] Another study also performed in Al-Nasiriya province in period from 2010 to 2012 where the rate of infection was high in 2012 at to 0.91%, however, in 2011 and 2010 were 90 (0.49%) and 60 (0.32%) respectively.[26]In our study, blood group A positive represents the highest prevalence positiveness for syphilis followed by O positive, B positive, and AB positive respectively. This contradicts the results of a study conducted in Al-Nasiriya province (Iraqi southern), where blood group O positive recorded with high prevalence of syphilis 92 (46%), A positive group 64(32%), B positive group 33(16.5%), and AB 11(5.5%) respectively.[25] The results of this study is also contrasting the results of other studies conducted in different countries where they found that the highest prevalence of syphilis appeared in blood group B in Pakistan.[27] Whereas in UK, USA, Nigeria and India blood groups O positive was significant. Similarly, In Iran, O+ group was the comments blood group appeared with frequency of 665,943 (32.8%), and only one O- with frequency (0.00004%) was the lowest among 2,028,086 blood donors in Tehran Blood Transfusion Center during 2005-2011.[28]In Sudan, especially in Gabon, the relation of syphilis

and blood group appeared with counterproductive, where prevalence of syphilis appeared in blood group O (58.9%) out of 4744 blood donors.[2] In Europe, France for example, frequencies of ABO was 45.0% in blood group A followed by 43.0%, 9.0%, and 3.0% in blood group O, B, and AB respectively.[29] In all studies in addition to our study AB blood group is the lowest for positive prevalence of syphilis. Most blood donors in this study from male and represent 1208 (98%) while female represent 25 (2%), because most donors was from male, this result similar to another study found that 98% of their donors were male,[30] In a study performed in Thi-qar province also found the infection with syphilis in male was 94.5% while in female was 5.5% from 200 cases out of 28287 blood donors in blood bank in Al- Nasiriya and blood bank in suq Al-Shiok, Refaei, and Al-Shatra.[25] In Iran, most blood donors were from male in 9918 (95%) and 558 (5%) were female.[28] Seroprevalence of syphilis in this study was 0.69% apparently equal to seroprevalence among Al-Nasiriya province blood donors were 0.71% ,[25] in Pakistan blood donors were 0.75%,[31] and appeared 0.85% among Indian donors,[32] and 1.2 % among Nigerian donors.[33] In Israel the prevalence of syphilis was 47:100,000 donors.[34] In Sharjah, United Arab Emirates, out of 20670 expatriates from both sexes male and female, only 105 (0.51%) appeared with positive prevalence of syphilis and those were from India, Pakistan, and Bangladesh ethnicity.[5] Study performed in India in 2012 recorded 198 (0.2%) seropositive for syphilis out of 104925 blood donors. In Tahran, seroprevalence of syphilis was 212 (0.010%) through period from 2005 to 2011.[28] In Sudan Seroprevalence of syphilis was 77 (1.6%) from 4744 blood donors.[2] Chengdu in China recorded 20,510 cases of blood donation infected with syphilis out of 2,100,071 in Chengdu blood center during period from 2005-2017, rate of syphilis in 2005 was 0.88% and showed increased rate of the infection in 2017 where it reached 0.98% and it was thought due to many risk factors such as: multiple sexual partners, commercial sex, razor reuse, ear piercing, tattoo, and sometimes the condom.[9] In summary, a significant association between syphilis and ABO groups was found among blood donors.

Conclusion

Our study showed increased in prevalence of syphilis among blood donors in Baghdad province the center of Iraq country as a result of Iraq's opening up to neighboring countries, expatriates enter without health oversight, and even on the people of the country since 2003, the beginning of openness our society on other societies. Blood safety is required in all blood donor banks in Iraq to control blood transfusion.

Acknowledgment: I would like to thankful all staff worked in Iraq National Blood Donors Bank/Baghdad city/Iraq for their endeavors to complete screening tests requested by each volunteer and included HIV, HCV, HBV, and syphilis.

Ethical Clearance: The Research Ethical Committee at scientific research by ethical approval of both MOH and MOHSER in Iraq

Conflict of Interest: Non

Funding: Self-funding

References

1. Stokx J, Gillet P, Weggheleire AD, Casas EC, Maendaenda R, Beulane AJ, et.al. Seroprevalence of transfusion-transmissible infections and evaluation of the predonation screening performance at the Provincial Hospital of Tete, Mozambique BMC Infectious Diseases. 2011; 11:141.
2. Ngassaki-Yoka CD, Ndong NMJ, & Bisseye C. "ABO, Rhesus blood groups and transfusion-transmitted infections among blood donors in Gabon," Sudan Journal of Medical Sciences, 2018; 13(1):12–21.
3. World Health Organization. "Global Database on Blood Safety". 2011
4. Anstee DJ, "The relationship between blood groups and disease", Blood, 2010; 115(23): 4635-4643.
5. Abdul-aziz A.E., AlAzzawi M., Abakar D.A., Nour Y.M.B., AbuOdeh R., and ElBakri A. Prevalence of syphilis and human immunodeficiency virus in expatriates in Sharjah, United Arab Emirates. Tropical Biomedicine. 2016; 33(4):613-618.
6. Tipple C, Jones R, McClure M, Taylor G. Rapid Treponema pallidum clearance from blood and ulcer samples following single dose benzathine penicillin treatment of early syphilis. PLoS Negl Trop Dis. 2015; 9(2).
7. Van-Dyck E., et al. study group on heterogeneity of hiv epidemics in zeltser r, kurban ak. syphilis. clinics in dermatology 22(2004):461-468
8. Rajabi MT, Makateb A, Hassanpoor N, Hosseini SS, Bazvand F, Tabatabaieet ZS, et al. Determinative factors in surgical planning of eyebrow cosmetic and reconstructive surgery. Clin Ophthalmol. 2017;11: 1333–1336.
9. Liu S, Luo L, Xi G, Wan L, Zhong L, Chen X, Gong T, Li S, He Y, and Li N. Seroprevalence and risk factors on Syphilis among blood donors in Chengdu, China,from 2005 to 2017. BMC Infect Dis. 2019; 19: 509.
10. Gillen MM, Dunaev J. Body appreciation, interest in cosmetic enhancements, and need for uniqueness among U.S. college students. Body image. 2017; 22:136–143.
11. Ng JH, Yeak S, Phoon N, Lo S. Cosmetic procedures among youths: a survey of junior college and medical students in Singapore. Singap Med J. 2014; 55(8):422–426.
12. Sarwer DB, Cash TF, Magee L, et al. Female college students and cosmetic surgery: an investigation of experiences, attitudes, and body image. Plast Reconstr Surg. 2005; 115(3):931–938.
13. Gerbase AC, Rowley JT, Heymann DH, Berkley SF, and Piot P. Global prevalence and incidence estimates of selected curable STDs. Sex Transm Infect. 1998; 74(1):S12-6.
14. Buseri FI, Muhibi MA, and Jeremiah ZA. Sero-epidemiology of transfusion-transmissible infectious diseases among blood donors in Osogbo, south-west Nigeria. Blood Transfus. 2009; 7(4): 293–299.
15. Liumbruno1 GM and Franchini M. Beyond immunohaematology: the role of the ABO blood group in human diseases. Blood Transfus. 2013; 11(4): 491–499.
16. Storry JR, Castilho L, Daniels G, Flegel WA, Garratty G, Haas Md, et al. International Society of Blood Transfusion Working Party on red cell immunogenetics and blood group terminology: Cancun report (2012). The international journal of transfusion medicine. 2013; 107(1): 90-96.
17. Jefferys SD, Kenneth CA. Transfusion Biology and therapy in Gerad L. Mandell principle and practice of infectious disease. 6th Ed Philadelphia I chruchill Livingston. 2005;46:708.
18. Wolpin MB, Chan TA, Hartge P, Chanock JS, Kraft P, Hunter JD, et al. "ABO blood group and the risk of pancreatic cancer", Journal of the National Cancer Institute. 2009; 101(6):424-31.

19. Wolpin. MB, Kraft P, Gross M, Helzlsouer K, Bueno-de-Mesquita BH, Steplowski E, et al."Pancreatic cancer risk and ABO blood group alleles: results from the pancreatic cancer cohort consortium", Cancer Research, 2010;70(3):1015-23

20. Wolpin MB, Kraft P, Xu M, Steplowski E, Olsson LM, Arslan AA, et al."Variant ABO blood group alleles, secretor status, and risk of pancreatic cancer: results from the pancreatic cancer cohort consortium", Cancer Epidemiology, Biomarkers & Prevention, 2010;19(12): 3140-9.

21. Bedu-Addo G, Gai PP, Meese S, Eggelte AT, Thangaraj K and Mockenhaupt FP. Reduced prevalence of placental malaria in primiparae with blood group O. Malaria Journal, 2014;13:289.

22. Gates AM, Wolpin MB, Cramer DW, Hankinson ES and Tworoger SS. "ABO blood group and incidence of epithelial ovarian cancer", International Journal of Cancer, 2011; 128(2): 482-6.

23. Wiggins LK, Smith LN, Glazer LN, ROSENDAAL RF, HECKBERT RS, PSATY MB, et al. "ABO genotype and risk of thrombotic events and hemorrhagic stroke", Journal of Thrombosis and Haemostasis, 2009; (7)2: 263-9.

24. Gerald l, douglas m. principles and practice of infectious disease. 5th ed. Churchill, 2000: 1-39.

25. AL-Erjan MA, AL-Jobori MK, and Abbas A. Epidemiological Study for Prevalence and Incidence of Syphilis among Blood Donors in Thi-qar Province. Chronicle of Medicine and Surgery. 2017, 1(1): 3-9.

26. Al-Badry J.B. Seroprevalence of syphilis infections among male blood donors at Thi-Qar province. J Univ Thi-Qa. R. 2014; 9(2):1-5.

27. Batool Z., Durrani S.H., and Tariq S. Association of ABO and Rh blood group types to hepatitis B, hepatitis C, HIV, and syphilis infection, a five year experience in healthy blood donors in a tertiary care hospital. J Ayub Med Coll Abbottabad. 2017; 29(1).

28. MohammedAli F., Pourfathollah A. Association of ABO and Rh blood groups to blood-borne infections among blood donors in Tehran-Iran. Iranian J Publ Health. 2014; 43(7): 981-989.

29. https://www.ints.fr/SangTransfGrSanguin.aspx.

30. Muktar H.M., A.M. Suleiman, M. Jones, Safety of blood transfusion: prevalence of hepatitis B surface antigen in blood donors in Zaria, Northern Nigeria. Nigerian journal of Surgical Research. 2005; 7(3&4): 290-292.

31. Bhatti F.A., Z. Ullah, N. Salamat, M. Ayub, E. Ghani,. Anti-hepatitis B core antigen testing, viral markers, and occult hepatitis B virus infection in Pakistani blood donors: implication for transfusion practice. Transfusion. 2007;47(1):74-79.

32. Gupta N., V. Kumar, A. Kaur,. Seroprevalence of HIV, HBV, HCV, and syphilis in voluntary blood donors. Indian J Med Sci. 2004; 58(6): 255-256.

33. Olokoba AB, Olokoba LB, Salawu FK, Danburam A, Desalu OO, et al. Syphilis in Voluntary Blood Donors in North-Eastern, Nigeria.European Journal of Scientific Research.2009;31(3):335-340.

34. Vera L, Milka D, Nurith SL, Eilat S. Prevalence and Incidence of Syphilis among Volunteer Blood Donors in Israel. Journal of Blood Transfusion, 2014:1-7.