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Prevalence and Trends of Transfusion-Transmissible Infections among Blood Donors in a tertiary care centre: A Ten Year Retrospective Study.

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ABSTRACT
BACKGROUND
Around the world, through blood transfusions millions of lives are being saved annually. Nevertheless blood transfusions are considered as a potential risk factor for transmission of life-threatening infections. Transfusion-transmitted infections are the major problem associated with blood transfusion. The overall prevalence of Transfusion Transmissible infections(TTIs) among blood donors differs around the world. This study aims to assess the prevalence and trends of TTIs among blood donors in a tertiary care centre, Tirupati.

KEYWORDS: Blood donors, transfusion transmitted infections, HIV, HBsAg, Syphilis, Malaria, HCV, Prevalence.

I. BACKGROUND

Blood transfusion is a life-saving procedure, around the world it saves millions of lives every year. It can be transfused as whole blood for one patient or as blood derived products to be delivered for more than one patient. Nevertheless, it is known that blood transfusion can be associated with risks of transmitting certain infections[1,2]. Blood transfusion can cause disease, if the collected units are not tested properly for the presence of micro-organisms before transfusion[3].

These Infecions are known as Transfusion Transmissible Infections(TTIs) which defined as any infection that can be transmitted from person to person through parenteral administration of blood or any blood products. Unsafe transfusion is followed by different outcomes, as it can cause acute clinical illness; as a carrier in the receiver; cause asymptomatic infection[4].

These infections include viral, bacterial, parasites and prions.

LIST OF MAIN DISEASES TRANSMITTED THROUGH BLOOD[3,5]

VIRAL	BACTERIAL	PARASITIC	PRION
Hepatitis B	Syphilis	malaria	CJD
Hepatitis C	Brucella	toxoplasma	
Hepatitis D	microfilaria	Trypanosome Cruzi	
Hepatitis G		Babesia microti	
HIV		Leishmania donovani	
EBV			
CMV			
HTLV 1& 2			
WEST NILE VIRUS			
DENGUE VIRUS			

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PARVOVIRUS B19			

HIV- Human Immunodeficiency virus, EBV- Ebstein Barr Virus, CMV- Cytomegalo virus, HTLV- Human T lymphotropic virus, CJD- Creutzfeldt Jacob Disease.

The safety of whole blood transfusion process involves many global efforts such as recommendations and guidelines to organize national blood screening and surveillance system for entire transfusion process i.e hemovigilance system. Global Database on Blood Safety (GDBS) established aiming to improve transfusion services globally[6,7].

II. METHODS

STUDY SETTING

Conducted at the Model Blood Centre of SVRRGGH, Tirupati, only provider of blood and blood components in Tirupati. Its main function is to provide safe blood whenever needed. The Centre follows National Blood Transfusion Council guidelines and recommendations. All donated unit samples undergo screening tests prior transfusion for the following infections through following methods.

Infectious agent	Screening test
HIV	MICROLISA HIV Ag & Ab
HbsAg	Hepalisa (Microwell ELISA Test)
HCV	ERBA LISA (ELISA)
Syphilis	Rapid Plasma Reagin test
Malaria	Rapid kit

DATA COLLECTION

A total of 70796 donations were received at Model Blood Centre in Sri Venkateswara Ramnarayan Ruia Government General Hospital (SVRRGGH), Tirupati in the period between January 2012 to December 2021. This study is a retrospective study. All data included in the study were retrieved from the records anonymously.

DATA ANALYSIS

Data were extracted from the records and entered into Microsoft excel. Percentages were used for the description of blood donors by gender, age groups, types of donor data.

RESULTS

A total of 70796 donations were received at Model Blood Centre in Sri Venkateswara Ramnarayan Ruia Government General Hospital (SVRRGGH), Tirupati in the period between January 2012 to December 2021. About 69255, 98% were males and 1541, 2% from females(Table1).

Table 1: sex distribution among blood donors

YEAR	TOTAL	MALES	FEMALES
2012	7238	7083	155
2013	6810	6664	146
2014	7220	7045	175
2015	7942	7730	212(13.8%)
2016	7704	7550	193
2017	6925	6762	163
2018	8324	8146(11.7%)	178
2019	8059	7936	123
2020	4948	4889(7%)	59(3.8%)
2021	5626	5489	137
	70796	69255(98%)	1541(2%)

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Blood donors are categorized in to six groups based on their age. They are 18-20, 21-30, 31-40, 41-50, 51-60 and >60 years. Age group of 21-30 years were predominant blood donors with 48% during study period followed by 31-40 years, with 35%. 10% and 5% contribution from 18-20 years age group and 41-50 age group and no donation were recorded from >60 age group(Table 2).

Table 2: Age distribution among blood donors

YEAR	TOTAL	18-20	21-30	31-40	41-50	51-60	>60
2012	7238	724	3247	2533	507	217	0
2013	6810	613	3133	2452	409	203	0
2014	7220	578	3393	2383	650	216	0
2015	7942	794	3971	3177	0	0	0
2016	7704	616	3852	2312	770	154	0
2017	6925	692	2770	2769	625	69	0
2018	8324	999	3995	3080	250	0	0
2019	8059	806	4030	2981	161	81	0
2020	4948	495	2722	1682	49	0	0
2021	5626	731	3206	1575	114	0	0
	70796	7048 (10%)	34329 (48%)	24944 (35%)	3535 (5%)	940 (2%)	0

Among collected donor units 67402 units, 95% from voluntary donors and 3394 blood units, 5% from replacement donors(Table 3).

Table 3: Donor data for blood transfusion

YEAR	TOTAL	VOLUNTARY	REPLACEMENT
2012	7238	6732	506
2013	6810	6334	476
2014	7220	6715	505
2015	7942	7387	555
2016	7704	7150	554
2017	6925	6441	484
2018	8324(11.8%)	8241	83
2019	8059	7958	101
2020	4948(7%)	4891	57
2021	5626	5553	73
TOTAL	70796	67402(95%)	3394(5%)

Out of 70796 blood donors, 1191(1.68%)cases came positive for infectious markers. The overall HIV prevalence during study period is 0.14% i.e 101cases. 1017 (1.43%) cases came positive for HbsAg in study period. 28(0.03%) and 45(0.06%) cases came positive for HCV and Malaria respectively during study period and no Syphilis case recorded during study period(Table 4)

Table 4 Yearly and overall prevalence of Infectious Markers among blood donors

YEAR	TOTAL	HIV	HBsAg	HCV	SYPHILIS	MALARIA
2012	7238	16(0.2)	169(2.33)	2(0.02)	NIL	5(0.06)
2013	6810	13(0.19)	168(2.46)	10(0.14)	NIL	5(0.07)
2014	7220	24(0.33)	125(1.73)	8(0.11)	NIL	4(0.05)
2015	7942	7(0.08)	125(1.57)	2(0.025)	NIL	5(0.06)
2016	7704	9(0.11)	114(1.47)	2(0.02)	NIL	4(0.05)
2017	6925	5(0.07)	74(1.06)	1(0.01)	NIL	4(0.05)
2018	8324	11(0.13)	84(1.0)	1(0.01)	NIL	5(0.06)
2019	8059	7(0.08)	87(1.07)	1(0.01)	NIL	4(0.04)
2020	4948	5(0.1)	42(0.84)	NIL	NIL	5(0.1)
2021	5626	4(0.07)	29(0.5)	1(0.01)	NIL	4(0.07)
	70796	101 (0.14)	1017 (1.43)	28 (0.03)	NIL	45 (0.06)

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Among all blood donors during study period, infectious markers are predominant in voluntary donors 827, 69.5% and with 64 i.e 30.5% blood donations from replacement donors.(Table 5)

Table 5; Infectious markers among blood donors

Infectious markers	Voluntary donors	Replacement donors
HIV	75	26
HbsAg	701	316
HCV	22	6
Syphilis	Nil	nil
Malaria	29	16
Total 1191	827(69.5%)	364(30.5%)

Among all years of this study , HIV prevalence is more in 2014 and for HbsAg the prevalence is more in 2013

Table 6: Yearly distribution of infectious markers among blood donors

YEAR	HIV-VD	HIV-RD	HBsAg-VD	HBsAg-RD	HCV-VD	HCV-RD	SYP-VD	SYP-RD	MAL-VD	MAL-RD
2012	12(16)	4(15)	109(16)	60(19)	2(9)	0	0	0	3(10)	2(13)
2013	10(13)	3(12)	118(17)	50(16)	9(41)	1(17)	0	0	4(14)	1(6)
2014	14(19)	10(38)	95(14)	30(9)	6(27)	2(33)	0	0	2(7)	2(12)
2015	5(7)	2(8)	90(13)	35(11)	2(9)	0	0	0	4(14)	1(6)
2016	7(9)	2(8)	90(13)	24(8)	0	2(33)	0	0	3(10)	1(6)
2017	4(5.3)	1(3.8)	41(5.8)	33(10)	1(17)	0	0	0	2(7)	2(12.5)
2018	9(12)	2(8)	50(7)	34(11)	1(17)	0	0	0	2(7)	3(19)
2019	6(8)	1(3.8)	67(10)	20(6)	0	1(17)	0	0	1(3.5)	3(19)
2020	4(5.3)	1(3.8)	22(3)	20(6)	0	0	0	0	4(14)	1(6)
2021	4(5.3)	0	19(3)	10(3)	1(17)	0	0	0	4(14)	0
	75(100)	26(100)	701 (100)	316(100)	22 (100)	6 (100)	0	0	29 (100)	16 (100)

Among all the infectious markers HbsAg is predominant. Initially all the infectious markers showed inclining trend but later followed by decline pattern(figure 1).

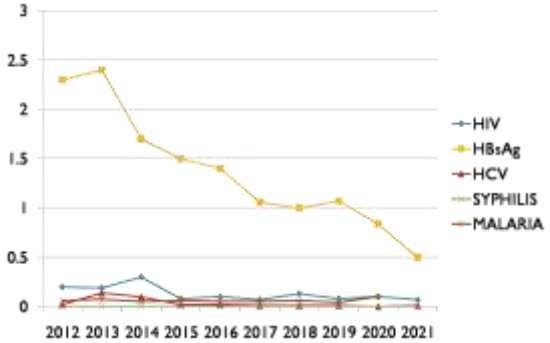

Figure1: Depicting trends of infectious markers over study period.

III. DISCUSSION

This study is a ten year retrospective study compared to other studies of India which happened to be study of one year to seven years. HbsAg is the predominant infectious marker among all the infectious markers in all the studies followed by HIV prevalence rate. No Syphilis case registered in this study .

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Figure 2: Comparing the present study with other studies

STUDIES	REGION	PERIOD	HIV	HBsAg	HCV	SYPHILS	MALARIA
Present study	Andhra Pradesh	2012-2021	0.14	1.43	0.03	0	0.06
Leena Ms et al[12]	South India	2004-2010	0.27	0.71	0.14	0.1	0.129
Amrutha kumari B et al[13]	Karnataka	2006-2010	0.63	1.77	0.13	0.28	-
Kumar R et al[14]	Punjab	2008-2013	0.26	1.03	1.53	1.74	0.006
Panda M et al[15]	Orissa	2005	0.35	1.13	1.98	-	-
Sastry JM et al[16]	Pune	2008-2013	0.28	1.23	0.41	0.008	-

Even though blood transfusion saves millions of lives every year, unsafe blood remains a threat to the spread of infections. It's important to address that safe blood is considered as a universal right, and it should not cause any harm. Thus, it should be fully screened and ensure not to be contaminated by any transmissible infection[8].

The valuable sources of prevalence of transfusion transmissible infections among blood donors are blood banks.

In literature, the prevalence of TTIs among blood donations varies between high and low-income countries. It was reported that the prevalence of HIV, HBV, HCV and Syphilis is lower compared to the prevalence of these infections in low-income countries.

With introduction of serological assays targeting virus-specific antibodies and antigens has been effective in identifying blood donations infected with the classic transfusion –transmitted infectious agents. With Progressive implementation of Nucleic acid-amplification technology (NAT) screening for HIV, HCV, and HBV has reduced the residual risk of infections-window period donations, in high income countries and in high-incidence regions performing NAT.

In this study, male predominance in blood donations was consistent with several studies. Literatures showed that women due to physiological factors like menstruation, lactation and pregnancy contribute less to blood donations.

The male predominance in blood donations was also observed in regards TTIs positivity rates as this study along with other studies showed consistent predominance throughout most of the years in which rates were higher in male donors.

In regard with blood donations younger population made higher contribution much of those belonging to age group 21-30 years, followed by 31-40 years as shown in other studies. Additionally, positivity rates of infections were found to be higher in the younger population , which is also found in other studies.

In literature, young males are much likely to be involved in risky behaviour than females and older age groups. Several studies showed that some younger male donors involved in risky behaviour contribute to blood donations, they do so in order to check whether they are infected with any of these infections or not.

In summary, this study revealed fluctuating trends for HBV, HCV, HIV, and Malaria.

Despite the important study findings, its important to mention some worthy limitations. This study is a retrospective study conducted by taking into account of blood donor centre records. The study was limited to the available data found in these records only, which included tabulated results of the screening tests by basic demographics categories i.e age, gender. Finally its impossible to assess the outcome of donors with positive results for any of the infections, as the donation records are not connected with the medical records.

IV. CONCLUSION

Inspite of above limitations, this study still gives important findings that contribute to a better understanding of TTIs. To Our knowledge, this is the first study to assess the prevalence and trends of TTIs, including HIV, HbsAg, HCV, Syphilis and Malaria among blood donors in Model blood centre, SVRRGGH, Tirupati. Prevalence of TTIs in the present study is more in Voluntary donors of age group 21-30 and in males. Among infectious markers HbsAg is predominant. All infectious

markers are in decreasing trend might be due to high pre donation deferral rate and effective impact of government awareness programs. Further investigations are needed to assess the distribution and determinants of these infections in the community to support the development of effective prevention and control strategies and to protect the community from potential hazards.

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