Ann Ist Super Sanità 2023 | Vol. 59, No. 3: 180-186
DOI: 10.4415/ANN_23_03_02

Knowledge and behaviours associated with HIV infection and other sexually transmitted infections in blood donors in Italy

Vincenza Regine[1]*, Lucia Pugliese[1]*, Alice Simonetti[2], Francesco Marchionni[2], Gianpietro Briola[2], Vincenzo Saturni[2] and Barbara Suligoi[1]

[1]*Dipartimento di Malattie Infettive, Istituto Superiore di Sanità, Rome, Italy*
[2]*Associazione Volontari Italiani del Sangue (AVIS), Milan, Italy*
**This Authors contributed equally to this manuscript as co-first Author*

Abstract

Introduction. Sexually transmitted infections (STIs) represent a group of widespread infectious diseases. The objective of this study is to investigate the knowledge on HIV and STIs as well as sexual risk behaviours among blood donors in Italy.

Materials and methods. The study was carried out in 2017 among blood donors who accessed social media of the Italian Association of Blood Donors (Associazione Volontari Italiani del Sangue, AVIS), and answered to a questionnaire posted online.

Results. Participating blood donors were 9,021, median age 36 years (IQR 26-47), 53.9% males, 94.3% heterosexual, and 2.7% reported having a current occasional partner. Unprotected sex in the last 4 months was reported by 54.1% of participants. About half of the participants were not informed of most STIs, 11.0% reported never having searched for information on HIV and STIs, one third considered unlikely acquiring HIV through unprotected sex with a known person, 21.3% would stop having sex with a partner found to be HIV-positive, and 15.8% would be afraid to hug or kiss a person with HIV.

Discussion. Our results show that most blood donors have a stable partner and search actively for information on HIV and STIs. However, there is a proportion of them who engage in high-risk behaviours, have misconceptions on HIV and STIs transmission, reporting a stigmatising attitude towards people with HIV.

Conclusion. A more comprehensive and updated information on various STIs, transmission modes and safe sex should be provided to blood donors, not only to prevent the spread of these infections but also to avoid unjustified discrimination.

Key words
- blood donors
- HIV
- STI
- knowledge
- at-risk behaviour

INTRODUCTION

Sexually transmitted infections (STIs) represent a group of highly spread infectious diseases, both in Italy and worldwide [1-4]. Their prevention is acknowledged to be a primary goal of the public healthcare system and it is crucial among blood donors in ensuring blood safety [5-7].

In Italy, about 2,000 new HIV diagnoses are reported each year and approximately 130,000 people are estimated to be living with HIV; out of these, about 15,000 are still undiagnosed [8-10].

The number of STIs cases showed a 42% increase between 2005 and 2019, according to data reported to the sentinel STIs surveillance system [11].

The spread of HIV and other STIs among blood donors is constantly monitored by the Information System of Transfusion Services (Sistema Informativo dei Servizi Trasfusionali, SISTRA) [12].

In 2020, SISTRA data reported 1,420 blood donors who tested positive for at least one of the four mandatory transfusion-transmissible infection markers. In 2020, among regular blood donors about 1.9 out of 100,000 blood donors tested positive for HIV, 12.6 for HBV, 1.0 for HCV and 9.3 for syphilis, whereas among first-time blood donors, 9 per 100,000 were positive for HIV, 109.8 for HBV, 45.5 for HCV and 96.2 for syphilis [12]. The number of blood donors positive to hepatitis B and C decreased in the last ten years whereas the number of blood donors positive to syphilis was stable, nevertheless prevalence of syphilis remains the highest

Address for correspondence: Vincenza Regine, Dipartimento di Malattie Infettive, Istituto Superiore di Sanità, Viale Regina Elena 299, 00161 Rome, Italy. E-mail: vincenza.regine@iss.it.

[13-15]. National data on mandatory notifiable syphilis show an increase in acute syphilis incidence since 2006 [16]. The incidence of HIV-positive blood donors remained stable in the last decade, differently from what observed in the national surveillance data that report a progressive decrease in the incidence of new diagnoses since 2012 [13-15]. However, a recent analysis showed that HIV rates observed among blood donors are only weakly associated with those observed in the general population [17]. This difference in HIV rates between blood donors and general population was compared internationally in a recent study. It is observed that Italy together with Spain have the highest HIV rates and authors attributed these differences to the donor deferral criteria which are based on a policy of gender neutrality, i.e. in both countries there are not differences based on sexual orientation in deferral policy of donors [17]. In this framework, it is undeniable that there is not only one way to remain alert on blood donation safety: alongside the deferral criteria, the knowledge of HIV/STIs at-risk behaviour and their prevention play a key role among blood donor population. An Italian study conducted among HIV-positive blood donors highlighted that the main reason for not having reported a risky behaviour in the pre-donation selection was "not realizing having engaged in a behaviour at risk infection" [18]. Behaviours at risk for HIV infection among blood donors were evidenced also in other Italian studies [19].

In this context, it is plausible that a proportion of the blood donor population has a poor knowledge of HIV/STIs sexual risk behaviour. The objective of this study is to investigate the knowledge on HIV and STIs as well as the frequency of sexual risk behaviours among blood donors in Italy.

MATERIALS AND METHODS

The study was carried out in 2017 by the Italian National Institute of Health (Istituto Superiore di Sanità, ISS) and by the Italian Association of Blood donors (Associazione Volontari Italiani del Sangue, AVIS) which is the largest Italian blood donor association, each year it contributes 70% of the national blood supply coming from blood donor associations, and the 37% of the national blood supply. The population was selected in the 3,300 AVIS seats located throughout the country. Each seat contacted its associates informing them of the survey and inviting them to participate. The survey was also disseminated among AVIS social media users by posting the invitation every two weeks. The study questionnaire was posted on the national AVIS website from February 28 to April 2, 2017. The survey was anonymous, in particular the system to collect data used set in order to prevent possible identification of the IP from which participants accessed to the survey.

The questionnaire included an initial question for the selection of blood donors and collected information on the following 4 field: demographic variables, sexual behaviours, level of knowledge on sexually transmitted infections, opinions and stigma towards HIV-positive people. Each field included about 10 open-ended or closed-ended or Likert scale questions. The questions on sexual behaviours were formulated taking into account the deferral criteria adopted in Italy (4 months from the last STIs sexual risk behaviour) if donors did not engage in "high risk behaviours" for which there is permanent deferral. Knowledge questions also included the sources of information: never get informed, family/friend comparison, in-depth internet searches, inquiries to doctors and specialists, scientific studies, participation in school/university/blood donor association training events. In this paper the answers were grouped into three modalities: No, never; Yes, a little, through internet search; Yes, a lot, through scientific sources.

The questions related to the opinions on STIs were formulated on a scale of 4 levels of agreement/probability (not at all, a little, enough, a lot), in this paper the answers were grouped into dichotomous variables (unlikely *vs* likely). The average time to complete questionnaire was approximately 15 minutes and 90% of the participants answered all the questions. Survey participants were 11,257 and of these 9,021 (80%) were blood donors. In this study, all the questionnaires filled in by people who declared to be a blood donor were included.

This work presents a description of HIV sexual risk behaviours among blood donors who participated in the survey. Specific differences for various subgroups have been evaluated using Chi-squared test: gender, age, geographical area, educational level, occupation, number of years from the first donation. In order to evaluate factors correlated to the never get informed on HIV and STIs, a multivariate logistic regression model was used. IBM SPSS v26 software was used for statistical analysis.

RESULTS

Population characteristics

This survey included 9,021 blood donors. *Table 1* describes demographic characteristics of participants, 29.7% of the interviewed declared to have been blood donor for less than 3 years while 37.6% for more than 10 years.

Sexual risk behaviours for HIV and other STIs

Table 2 shows sexual behaviours at risk of HIV infection and other STIs. About 80% of the blood donors interviewed had a stable partner and 94.3% declared to be heterosexual. More than a half (54.1%) had had unprotected sexual intercourse in the last 4 months, 96.5% of them were with a stable partner, 2.4% with an occasional partner, 1.1% of blood donors gave no information on partner status.

The main reason for not using of condom was both with stable and occasional partner the trust in their partner: 58.5% of answers for stable partner and 53.5% of answers for occasional partner. The use of drugs during sex was reported from 69 (0.8%) participants, 71.0% of them were blood donors less than 35 years old, 60.0% were males and 39.0% students (data not shown in the *Table*).

Knowledge on HIV and other STIs

Table 3 shows knowledge, opinions and false beliefs regarding HIV and STIs: 63.4% of blood donors declared to get informed a lot on HIV and STIs through scientific sources (papers, specialist books and conferences), a quarter of blood donors declared to get informed a

Table 1
Characteristics of 9,021 blood donors participating in the study, Italy, 2017

		N	%
Time elapsed from first blood donation	1-3 years	2,682	29.7
	4-6 years	1,599	17.7
	7-10 years	1,352	15.0
	>10 years	3,388	37.6
Gender	Male	4,864	53.9
	Female	4,157	46.1
Median Age (IQR[a])	36 (26-47)		
Age group (years)	<25	1,718	19.0
	25-34	2,408	26.7
	35-49	3,062	34.0
	≥50	1,833	10.3
Nationality	Italian	8,918	98.9
	Non-Italian	103	1.1
Area of residence	Northern Italy	5,895	65.3
	Central Italy	1,614	17.9
	Southern Italy and Islands	1,512	16.8
Education	Primary school	967	10.7
	Secondary school	5,095	56.5
	Degree	2,959	32.8
Occupation	Unemployed	803	8.9
	Employed	5,140	57.0
	Freelance	1,207	13.4
	Student	1,541	17.1
	Housewife/retired	330	3.6

[a]IQR = interquartile range.

little through internet search, while 11.0% declared to get never informed. The proportion of blood donors who inform themselves about HIV and STI changed by level of education. Higher proportion of people who inform themselves a lot from scientific sources were observed at high levels of education compared to people less educated: 54.0% among blood donors with primary school, 61.8% among those with secondary school and 69.1% among graduated blood donors (p-value <0.00). The multivariate regression logistic model showed that factors significantly correlated with never getting informed on HIV and STIs were: having a job compared to students (OR 1.75 CI 95% 1.27-2.41), having a middle and high school diploma compared to a degree (OR 1.74 CI 95% 1.39-2.18, OR 1.37 CI 95% 1.17-1.61, respectively), being heterosexual compared to MSM (OR 1.50 CI 95% 1.04-2.17), being male compared to female (OR 1.41 CI 95% 1.22-1.63), being aged between 25 and 49 years (OR 1.43 CI 95% 1.06-1.93) and older than 50 years (OR 2.18 CI 95% 1.55-3.05) compared to those younger than 25 years. The STIs known were as follows: HIV (90.8%), syphilis (39.5%), hepatitis B and C (27.6%), gonorrhoea (23.8%), whereas the least known STIs was Trichomonas infection (3.8%).

Table 2
Sexual behaviour of 9,021 blood donors participating in the study, Italy, 2017

	N	%
Sexual orientation		
Heterosexual	8,506	94.3
Homo-bisexual	515	5.7
Current partner		
Stable (>6months)	7,101	78.7
Occasional	242	2.7
None	1,678	18.6
Condom use during sex in the last 4 months		
No sexual intercourse	1,946	21.6
Sexual intercourse always with condom	2,191	24.3
Sexual intercourse without condom	4,884	54.1
Sex without condom with		
Stable partner	4,711	96.5
Occasional partner	116	2.4
na	57	1.1
Reasons for not using condom (with a stable partner)[a]		
I trust my partner	3,444	58.5
I do not want to use contraceptives	1,732	29.4
I am taking the contraceptive pill	527	8.9
Other reasons (not having handy condom, cost, allergy)	186	3.1
Reasons for not using condom (with an occasional partner)[a]		
I trust my partner	77	53.5
I do not want to use contraceptives	33	22.9
I am taking the contraceptive pill	0	0.0
Other reasons (I do not have a condom, cost, allergy)	34	23.6
Use of drugs during sex		
No	8,952	99.2
Yes	69	0.8

[a]More than one answer allowed; na: not available.

Opinions and stigma on HIV and other STIs

About a quarter of blood donors declared that it is unlikely to get infected during oral sex; this proportion was 30.4% among people over 50 years old and it is significantly higher (p-value <0.05) than in the lower age groups (22.0% among blood donors 25-49 years; 25.4% among blood donors <25 years) *(Figure 1)*. About 17% found it unlikely to be infected via anal intercourse; these percentages are significantly (p-value <0.05) higher among blood donors aged less than 25 years (20.3%) and among blood donors over the age of 50 years (21.1%) compared to the 25-49 age group (14.2%) *(Figure 1)*.

The proportion of blood donors who believe it is unlikely to get infected with an STI through either vaginal

Table 3
Knowledge on HIV and sexually transmitted infections (STIs) among 9,021 blood donors participating in the study, Italy, 2017

		N	%
Do you get informed on STIs?			
Yes, a lot, through scientific sources		5,724	63.4
Yes, a little, through internet search		2,308	25.6
No, never		989	11.0
The STIs I know are (open answer, % of total respondents)			
None		439	4.9
HIV/AIDS		8,187	90.8
Syphilis		3,566	39.5
Viral hepatitis (HBV, HCV)		2,486	27.6
Gonorrhoea		2,146	23.8
Genital herpes		1,515	16.8
Papilloma virus (HPV), ano-genital warts		1,052	11.7
Chlamydia, LGV		925	10.3
Other STIs (trichomonas, chancroid, etc.)		346	3.8
Can you acquire an STI through			
Vaginal sex	unlikely	364	4.0
	very likely	8,657	96.0
Vaginal sex during menses	unlikely	1,280	14.2
	very likely	7,741	85.8
Anal sex	unlikely	1,515	16.8
	very likely	7,506	83.2
Oral sex	unlikely	2,200	24.4
	very likely	6,821	75.6
HIV can be acquired through unprotected sex with			
Someone that you already known	unlikely	3,089	34.2
	likely	5,932	65.8
A new partner	unlikely	597	6.6
	likely	8,424	93.4
A partner who has same-sex	unlikely	1,133	12.6
	likely	7,888	87.4
Opinions and stigma			
Would you stop having sex if you find out that your partner is HIV+?	No	7,101	78.7
	Yes	1,920	21.3
Are you afraid of hugging or kissing an HIV+ friend?	No	7,599	84.2
	Yes	1,422	15.8
Would you share the room with an HIV+ person?	No	8,002	88.7
	Yes	1,019	11.3
Would you ban HIV+ children from public schools?	No	8,492	94.1
	Yes	529	5.9
Are you afraid of acquiring HIV in a public toilet?	No	7,713	85.5
	Yes	1,308	14.5
Do you agree in recording the names of HIV+ people in a national registry that can be accessed only by NHS workers?	No	3,417	37.9
	Yes	5,604	62.1

intercourse during menstruation, anal or oral sex, were significantly lower (p-value <0.05) in the 5,724 blood donors who declared to get informed on STIs through scientific sources (during menstruation 11.2%, anal 13.4%, oral 20.3%) compared to blood donors who declared to get informed a little on STIs or never (during menstruation 19.1%, anal 23.3%, oral 32.1%) (data not shown in *Table*).

Blood donors who considered it unlikely to be infected with HIV through unprotected sex with a person already known were 34.2%, with a partner who has same-sex sex 12.6% and with a new partner 6.6%. These proportions were significantly (p-value <0.05) higher in males compared to females *(Figure 2)*. The proportion of blood donors who considered it unlikely to be infected with HIV through unprotected sex with a new partner was significantly (p-value <0.05) lower in blood donors with a university degree (5.1%) compared to blood donors with a secondary school degree (11.4%). Significantly differences were observed in the proportion of blood donors who considered it unlikely to be infected with HIV through unprotected sex with a person who has same-sex sex in particular among blood donors with a degree was 9.5% while among blood donors with secondary school was 19.0% (p-value <0.05) (data not shown).

Table 3 shows stigmatizing opinions towards people with HIV. Blood donors stating that they would stop having sex if they found out that their partner was HIV positive were 21.3%, there were significantly (p-value <0.05) differences between males and females (23.3% *vs* 20.2%) (data not shown). Donors who would be afraid to hug or kiss an HIV positive friend were 15.8%, there were significantly differences in males compared to females (18.4% *vs* 14.1%) and in donors aged 50 and more compared to those younger (20.2% *vs* 15.3%) (data not shown). Donors that would not feel comfortable sharing common spaces with HIV positive people was 11.3%, there were no significant differences in terms of age, gender, level of education and occupation (data not shown).

DISCUSSION

The present study is the first large study that assessed knowledge, attitudes and opinions on HIV and other STIs among blood donors in Italy. Our survey shows that although a high percentage of blood donors declared to get informed through scientific sources on HIV and STIs mostly using reliable sources, there is still a proportion of them who engage in high-risk behaviours, have misconceptions on STIs and HIV transmission and report a stigmatising attitude towards people with HIV.

Regarding behaviours at risk of infection, it should be noted that 2% of participants had unprotected sex with occasional partners in the last 4 months. Attention should be paid to this proportion because these blood donors do not fulfil the selection criteria of eligible blood donors, underpinning that the selection process might not be flawless, and hence endanger blood safety. Blood donors who had unprotected sex in the last 4 months with occasional partners declared that they did not use

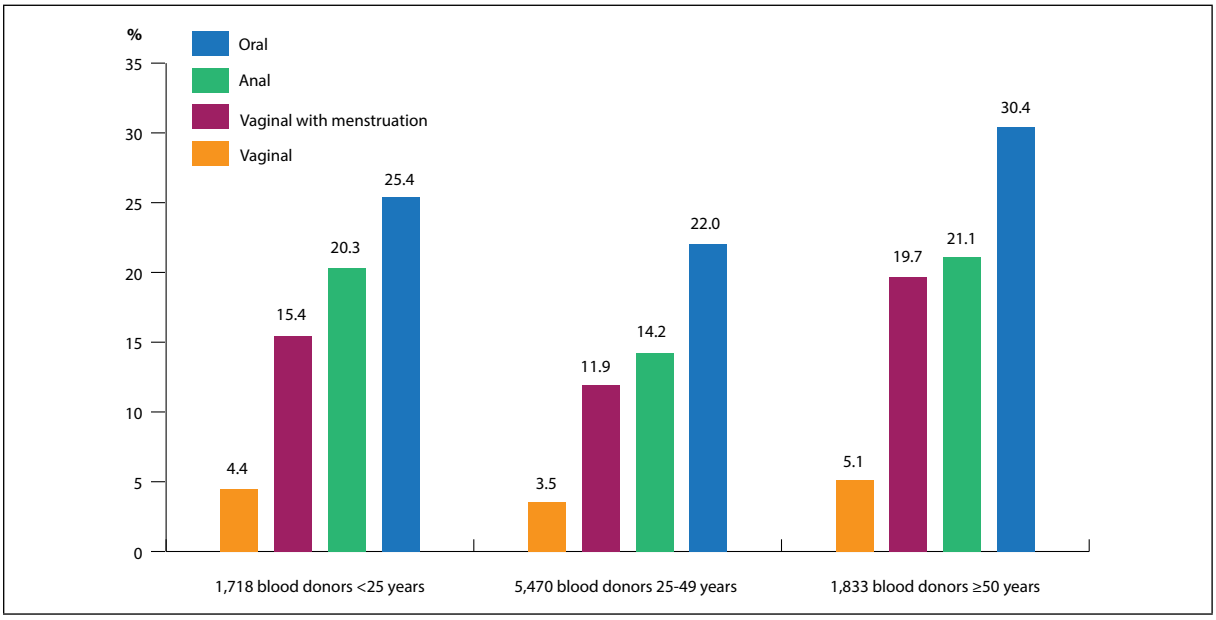

Figure 1
Proportion of blood donors who believe it unlikely to acquire an STI during sex (vaginal, vaginal with menstruation, anal, oral), by age group.

condoms because of their trust in their partners or because they used other contraceptive methods, such as oral contraceptives. The latter result clearly shows that condom is mainly considered a contraceptive rather than a protection also against infections, evidencing a poor knowledge on protection against STIs. Our study shows that more than 60% of the respondents get informed on STIs by consulting scientific sources. This result can be explained by the high awareness of blood donors who are motivated by the donation experience, and by the fact that our study sample was young and with a high education level. However, it should be noted that 11% of respondents reported never having looked for information on STIs.

Our study shows that a quarter of participants rate as unlikely acquiring an STI through oral sex, and one sixth through anal sex or vaginal intercourse during menstruation, therefore uncovering a poor knowledge on the risk of transmission modes. Specifically, unprotected anal sex implies the higher risk for HIV transmission [20-24]. Participants under 25 years and over 50 years of age showed the highest proportion of misleading information on STIs transmission. These results are important because the inadequate information on HIV/STIs might lead to engaging in unprotected sex [25-27]. Furthermore, our study shows that more than 90% of the respondents declared they knew HIV infection, while less than 40% knew other STIs. A

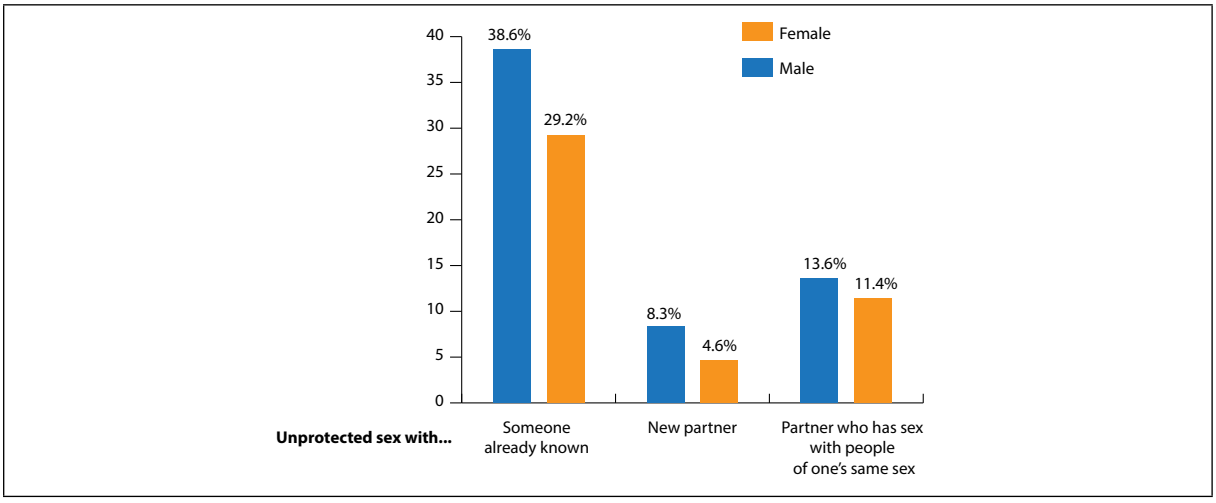

Figure 2
Proportion of blood donors who believe it unlikely to acquire HIV during unprotected sex with (someone already known, new partner, partner who has sex with people of one's same sex) by gender.

recent study carried out in Germany confirms similar findings [28].

We observed the highest percentages of misconception on STIs transmission among blood donors over 50 years of age. An insufficient knowledge on HIV/STI transmission is probably associated with the increasing HIV incidence trend among individuals older than 50 years reported both in Italy and in Europe in the last five years, as opposite to the decreasing trend observed in all other age groups [4, 8]. A systematic review showed that, compared to individuals under 45 years of age, heterosexuals aged between 45 and 64 years have a higher risk of acquiring an STI and among them, males have a higher risk of infection because of a lower condom use [29].

One fifth of respondents would stop having sex, even protected sex, if they would find out their partner as being HIV-positive, and one third would have unprotected sex with a partner if known. These results suggest that the risk of acquiring HIV/STIs is generally associated with a judgemental attitude towards "categories" of individuals (e.g., infected, friend, at risk, known person, trustful, etc.) rather than to at-risk sexual behaviour.

Stigmatizing beliefs emerged from a proportion of participants that stated being afraid of hugging or kissing an HIV-positive friend, or sharing a room with an HIV-positive person. Similar beliefs and stigmatising behaviours are still widespread in several countries. A study conducted in Spain showed that 50% of the population would feel uncomfortable having social relationships with HIV-positive people, although this percentage has decreased over time due to a number of information campaigns on the transmission mode of HIV infection [30, 31].

The added value of the study is having used Internet and the website of the largest Italian blood donor association to post the study questionnaire [32]. These options allowed to reach quickly and without costs a large number of blood donors all over the country. In addition, our sample is representative of the Italian population aged 18-65 years in terms of gender distribution, educational level and employment status. However, a selection bias towards a higher participation of individuals more sensitive to STIs prevention is to be considered [13, 33, 34].

CONCLUSION

Our findings stress the need to improve prevention policies and to increase awareness-raising campaigns on HIV/STIs transmission modes and the adoption of safe sexual behaviours among blood donors. Health staff operating in blood transfusion services have the opportunity to provide more in-depth information on HIV/STIs during the pre-screening procedures. Prevention initiatives using social media such as AVIS associative websites, newsletters and social webpages are extremely effective and should be incremented to facilitate the dissemination of correct health information and to achieve the highest quality standards in blood donations.

Authors' contributions

VR and LP contributed equally to this work as first Author. BS and VS are responsible for study conception. VR, LP, AS, FM, VS and BS designed the study. GB and VS are responsible for study funding. AS is responsible for data acquisition. AS and FM collected the data. VR and LP analysed the data. VR, LP and BS interpreted the data. VR and LP wrote and submitted the manuscript. BS commented on and reviewed the manuscript. All Authors have read and approved the final manuscript.

Funding

The study was funded by the Italian Association of Blood Donors, Milan, Italy.

Conflict of interest statement

The Authors declare no conflict of interests.

Received on 1 March 2023.
Accepted on 17 May 2023.

REFERENCES

1. World Health Organization. Sexually Transmitted Infections (STIs). Geneva: WHO; 2019. Available from: https://www.who.int/en/news-room/fact-sheets/detail/sexually-transmitted-infections-(stis).
2. World Health Organization. Global health sector strategy on sexually transmitted infections, 2016-2021. Geneva: WHO; 2016. Available from: https://apps.who.int/iris/bitstream/handle/10665/246296/WHO-RHR-16.09-eng.pdf?sequence=1.
3. Joint United Nations Programme on HIV/AIDS 2020. Global HIV & AIDS statistics. 2020 fact sheet. Geneva: UNAIDS; 2020. Available from: https://www.unaids.org/sites/default/files/media_asset/UNAIDS_FactSheet_en.pdf.
4. European Centre for Disease Prevention and Control/WHO Regional Office for Europe. HIV/AIDS surveillance in Europe 2020-2019 data. Copenhagen: WHO Regional Office for Europe; 2020. Available from: https://www.ecdc.europa.eu/en/publications-data/hivaids-surveillance-europe-2020-2019-data.
5. European Centre for Disease Prevention and Control. Long-term surveillance strategy 2014-2020. Stockholm: ECDC; 2013. Available from: https://www.ecdc.europa.eu/en/publications-data/long-term-surveillance-strategy-2014-2020-revised.
6. Ministero della Salute. Piano nazionale di interventi contro HIV e AIDS (PNAIDS). Rome: Ministero della Salute; 2017. Available from: http://www.salute.gov.it/imgs/C_17_pubblicazioni_2655_allegato.pdf.
7. Ministero della Salute. Piano Nazionale della Prevenzione 2020-2025. Rome: Ministero della Salute; 2020. Available from: http://www.salute.gov.it/portale/news/p3_2_1_1_1.jsp?lingua=italiano&menu=notizie&p=dalministero&id=5029-.
8. Regine V, Pugliese L, Boros S, et al. Aggiornamento delle nuove diagnosi di infezione da HIV e dei casi di AIDS in Italia al 31 dicembre 2020. Not Ist Super Sanità. 2021;34(11).
9. Mammone A, Pezzotti P, Regine V, et al. How many people

are living with undiagnosed HIV infection? An estimate for Italy, based on surveillance data. AIDS. 2016;30(7):1131-6. doi: 10.1097/QAD.0000000000001034

10. Regine V, Dorrucci M, Pezzotti P, et al. People living with undiagnosed HIV infection and a low CD4 count: estimates from surveillance data, Italy, 2012 to 2014. Euro Surveill. 2018;23(15). doi: 10.2807/1560-7917.ES.2018.23.15.17-00240
11. Salfa MC, Ferri M, Suligoi B. Le Infezioni Sessualmente Trasmesse: aggiornamento dei dati dei due sistemi di sorveglianza sentinella attivi in Italia al 31 dicembre 2019. Not Ist Super Sanità. 2021;34(7-8).
12. Catalano L, Piccinini V, Pati I, et al. Italian Blood System 2020: activity data, haemovigilance and epidemiological surveillance. Roma: Istituto Superiore di Sanità; 2021. (Rapporti ISTISAN 21/14).
13. Velati C, Romanò L, Pati I, et al. Studio di monitoraggio del rischio residuo di trasmissione trasfusionale delle infezioni da virus dell'immunodeficienza umana e virus dell'epatite B e C (Italia, 2009-2018). Roma: Istituto Superiore di Sanità; 2019. (Rapporti ISTISAN 19/26).
14. Velati C, Romanò L, Piccinini V, et al. Prevalence, incidence and residual risk of transfusion-transmitted hepatitis C virus and human immunodeficiency virus after the implementation of nucleic acid testing in Italy: a 7-year (2009-2015) survey. Blood Transfus. 2018;16:422-32. doi: 10.2450/2018.0069-18
15. Velati C, Romanò L, Pati I, et al. Prevalence, incidence and residual risk of transfusion-transmitted hepatitis B virus infection in Italy from 2009 to 2018. Blood Transfus. 2019;17:409-17. doi: 10.2450/2019.0245-19
16. European Centre for Disease Prevention and Control. Surveillance atlas of infectious diseases. Stockholm: ECDC; 2023. Available from: https://www.ecdc.europa.eu/en/surveillance-atlas-infectious-diseases.
17. Germain M, Grégoire Y, Custer BS, et al. An international comparison of HIV prevalence and incidence in blood donors and general population: a BEST Collaborative study. Vox Sang. 2021;116(10):1084-93. doi: 10.1111/vox.13107
18. Raimondo M, Facco G, Regine V, et al. HIV-positive blood donors unaware of their sexual at-risk behaviours before donation in Italy. Vox Sang. 2016;110(2):134-42. doi: 10.1111/vox.12328
19. Regine V, Raimondo M, Camoni L, et al. Low perception of sexual behaviours at risk for human immunodeficiency virus infection among blood donors who call the AIDS/STI Help Line in Italy. Blood Transfus. 2013;11(4):575-9. doi: 10.2450/2013.0257-12
20. Schöfer H. Sexuellübertragbare Infektionen der Mundhöhle [Sexually transmitted infections of the oral cavity]. Hautarzt. 2012;63(9):710-5. German. doi: 10.1007/s00105-012-2352-9
21. Ballini A, Cantore S, Fatone L, et al. Transmission of non-viral sexually transmitted infections and oral sex. J Sex Med. 2012;9(2):372-84. doi: 10.1111/j.1743-6109.2011.02515.x
22. Patel P, Borkowf CB, Brooks JT, et al. Estimating per-act HIV transmission risk: a systematic review. AIDS. 2014;28(10):1509-19. doi: 10.1097/QAD.0000000000000298
23. Nagelkerke N, Seedat S, Raddad A, et al. Sexual behaviour surveys should ask more: covering the diversity of sexual behaviours that may contribute to the transmission of pathogens. Sex Transm Dis. 2021;48(9):e119-e121. doi: 10.1097/OLQ.0000000000001347
24. Habel MA, Leichliter JS, Dittus PJ, et al. Heterosexual anal and oral sex in adolescents and adults in the United States, 2011-2015. Sex Transm Dis. 2018;45(12):775-82. doi: 10.1097/OLQ.0000000000000889
25. Mazzitelli M, Caridà G, Scigliano C, et al. Knowledge of HIV infection and transmission: a knowledge, attitudes, beliefs and practices (KABP) survey among a sample of students at the "Magna Graecia", University of Catanzaro. Ann Ist Super Sanità. 2016;52(4):530-5. doi: 10.4415/ANN_16_04_12
26. Copen CE. Condom use during sexual intercourse among women and men aged 15-44 in the United States: 2011-2015 National Survey of Family Growth. National health statistics reports n. 105. Hyattsville, MD: National Center for Health Statistics; 2017. Available from https://www.cdc.gov/nchs/data/nhsr/nhsr105.pdf.
27. Goldstein RL, Upadhyay UD, Raine TR. With pills, patches, rings and shots: Who still uses condoms? A longitudinal cohort study. J AdolescHealth. 2013;52(1):77-82. doi: 10.1016/j.jadohealth.2012.08.001
28. Skaletz-Rorowski A, Potthoff A, Nambiar S, et al. Age specific evaluation of sexual behaviour, STI knowledge and infection among asymptomatic adolescents and young adults. J Infect Public Health. 2020;13(8):1112-7. doi: 10.1016/j.jiph.2020.04.005
29. Monsell E, McLuskey J. Factors influencing STI transmission in middle-aged heterosexual individuals. Br J Nurs. 2016;25(12):676-80. doi: 10.12968/bjon.2016.25.12.676
30. Fuster MJ, Molero F, de Montes LG, et al. HIV- and AIDS-related stigma: psychosocial aspects in a representative Spanish sample. Span J Psychol. 2013;16:E30. doi: 10.1017/sjp.2013.52
31. Fuster-Ruizde Apodaca MJ, Molero F, Gil de Montes L, et al; Spanish Group for the Study of HIV-Related Stigma. Evolution of HIV-related stigma in Spain between 2008 and 2012. AIDS Care. 2014;26(Suppl. 1):S41-5. doi: 10.1080/09540121.2014.906557
32. Chiasson MA, Hirshfield S, Rietmeijer C. HIV prevention and care in the digital age. J Acquir Immune DeficSyndr. 2010;55(Suppl. 2):S94-7. doi: 10.1097/QAI.0b013e3181fcb878
33. Istituto Nazionale di Statistica. Censimento della popolazione e delle abitazioni: l'istruzione. Anno 2019. ISTAT; 15 dicembre 2020. Available from: https://www.istat.it/it/archivio/251658.
34. Istituto Nazionale di Statistica. Istruzione e formazione. Annuario Statistico Italiano 2020. Rome: ISTAT; 2020. Available from: https://www.istat.it/it/files//2020/12/C07.pdf.