HIV Infection Among Potential Blood Donors

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Abstract

The statistics on HIV in Russia in 2013 were studied and compared with the blood service data. It was found that among different contingents the minimum detection rate of HIV infection has been registered among blood donors. Maximum detection rate of HIV among men, who have sex with men, actualizes the need for a ban on their participation in blood donation. The detection rate of HIV among donors, as well as the ratio of detection of HIV among donors and other categories surveyed indicate a lack of efficiency of formation of donor contingent of supporters of a healthy lifestyle. A direct positive correlation of HIV was detected in blood donors and region population, the volume of blood processing, as well as all volumes of blood wastage due to markers of blood borne infections except the volume due to HBs-antigen.

Keywords: HIV; Infection; Donors; Statistics; Blood; Detection; Transfusion

Introduction

HIV transmission to a recipient is the most resonant adverse effect of blood transfusion [1]. From HIV infection epidemics onset and up to 2013 inclusive, 80 cases of HIV infection transmission during transfusion of fresh frozen plasma and blood products were registered in the Russian Federation. Since 2010, two such cases have been registered annually. In 2012-2013 the key reason for infection transmission during blood transfusion was red blood cell suspension transfusion from active donors in the seronegative period (Smolensk, Kemerovo regions). In March 2013 in St. Petersburg a child was transfused with red blood cells prior to donor’s HIV infection test results were received [2].

HIV infection prevention should be undertaken comprehensively as regards sources of the virus, mechanisms, routes and factors of transmission as well as sensitive population, including representatives of vulnerable groups of population [3].

It would be interesting to compare HIV detectability in donors with similar characteristics in other population groups both on regional and national scale.

Materials and Methods

The following materials have been studied:

- Main statistics on HIV infection in Russia;
- Data on HIV antibody test results;
- Data on HIV antibody test results on various subpopulation in the regions of the Russian Federation in 2013 [4].

It is worth noting that personified data on new HIV infection cases in Moscow in 2012-2013 were not given; the data includes persons who were detected in the Federal Scientific and Methodology Centre for AIDS Prevention and Control for the first time as well as the data for Moscow taken from the health monitoring form of the Russian Agency for Health and Consumer Rights.

HIV antibody test results were compared to the industry statistics on the institutions affiliate to the Ministry of Health of Russia for 2013.

The results were evaluated using descriptive statistics and correlation analysis with the level of significance of 0.05.

Results and Discussion

The number of HIV infected persons who applied to a donor point was minimal among the groups examined (Table 1). However, as shown in Table 1, the number of seropositives per 100,000 of serum samples was maximum in MSM group. The possibility to lift the ban for men practicing sex with other men is widely discussed on the international level [5]. The observed maximum infection detectability rate in this group makes actual the need to introduce the same ban in Russia.

The maximum HIV detectability rate among donors is in the regions with the highest overall HIV detectability rate (Table 2).

Donors take a significant part of those who were tested for HIV: median and interquartile interval of this parameter made 14.3% (10.9-18.6) in 2012 and 13.3% (10.6-17.3) in 2013.

The maximum share of donors in those tested is in the regions where plasma fractioning and collection points are located (Tables 3 and 4). The share of donors in the number of HIV-positive persons is low: median and interquartile interval of this parameter made 1.3% (0.8-2.6) in 2012 and 1.4% (0.9-2.2) in 2013. The list of regions with the highest value of this parameter is quite varying (Table 5). In 2012 no HIV-positive donors were identified in 12 regions (Republic of Kalmykia, Belgorod region, Karachay-Cherkess Republic, Republic of Mari El, Republic of Sakha (Yakutia), Ryazan region, Yamalo-Nenets Autonomous District, Voronezh region, Kamchatka, Chukot Autonomous Area, Nenets Autonomous Area). In 2013 the number of such regions reduced to 8 (Amur region, Sakhalin region, Jewish Autonomous Region, Republic of Ingooshetia, Republic of Kalmykia, Karachay-Cherkess Republic, Chukot Autonomous Area, and Nenets Autonomous Area).

The ratio of HIV detectability among donors and other categories examined indirectly may show the quality of healthy donor recruiting.

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Table 1: Number of new HIV infection cases among various categories of examined persons in Russia in 2012 – 2013.

| Category                                           | 2012            | 2013            | 2012            | 2013            |
|----------------------------------------------------|-----------------|-----------------|-----------------|-----------------|
| Blood serum examined                               | 451,312         | 455,737         | 122,600         | 126,066         |
| HIV+ examined                                      | 162             | 166             | 57,924          | 61,162          |
| Blood serum examined HIV+ examined                 | 35.9            | 36.4            | 21,660          | 22,770          |
| Total                                              | 3,446,847       | 3,382,246       | 976             | 1,017           |
| Note: *number of seropositive per 100,000 of serum samples examined |                 |                 |                 |                 |

Table 2: Regions with the highest HIV infected detectability in 2013.

| Region                                           | 2012            | 2013            | 2012            | 2013            |
|--------------------------------------------------|-----------------|-----------------|-----------------|-----------------|
| Kirov region                                      | 41.7            | 35.3            | 41.7            | 35.3            |
| Tyumen region                                     | 30.9            | 34.1            | 30.9            | 34.1            |
| Ivanovo region                                    | 27.7            | 30.6            | 27.7            | 30.6            |
| Lipetsk region                                    | 27.6            | 26.2            | 27.6            | 26.2            |
| Kaluga region                                     | 25.9            | 25.1            | 25.9            | 25.1            |
| Stavropol region                                  | 25.9            | 24.9            | 25.9            | 24.9            |
| Volgograd region                                  | 23.1            | 23.9            | 23.1            | 23.9            |
| Republic of Karelia                               | 21.5            | 22.1            | 21.5            | 22.1            |
| Astrakhan region                                  | 21.5            | 20.6            | 21.5            | 20.6            |
| Altai Territory                                   | 21.4            | 19.9            | 21.4            | 19.9            |

Table 3: Regions with the highest number of donors among HIV examined in 2012 and 2013.

| Region                                           | 2012            | 2013            | 2012            | 2013            |
|--------------------------------------------------|-----------------|-----------------|-----------------|-----------------|
| Bryansky region                                   | 8.8             | Moscow          | 8.6             | Russia          |
| Kamchatka                                         | 8.4             | Chukot Autonomous Area | 8.1             | Russia          |
| Kabardino-Balkarian Republic                      | 8.2             | Bryansky         | 8.0             | Republic of Altai |
| Chukot Autonomous Area                            | 8.1             | Kamchatka        | 7.5             | Republic of Altai |
| Primorsky Kray                                    | 7.8             | Primorsky        | 7.5             | Republic of Altai |
| Volgograd region                                  | 7.6             | Volgograd        | 7.4             | Republic of Altai |
| Transbaikal Territory                              | 6.8             | Transbaikal      | 7.4             | Republic of Altai |
| Republic of Tatarstan                             | 6.5             | Republic of Tatarstan | 5.7             | Republic of Tatarstan |
| Moscow                                           | 5.5             | Moscow           | 4.5             | Republic of Tatarstan |
| Republic of Ingushetia                            | 4.2             | Republic of Ingushetia | 4.5             | Republic of Tatarstan |

Table 4: Regions with the lowest number of donors among HIV examined in 2012 and 2013.

| Region                                           | 2012            | 2013            | 2012            | 2013            |
|--------------------------------------------------|-----------------|-----------------|-----------------|-----------------|
| Republic of Tuva                                  | 7.7             | Republic of Tuva | 15.4            | Republic of Tuva |
| Orel region                                       | 7.6             | Chuvash Republic | 6.5             | Republic of Altai |
| Amur region                                       | 6.7             | Republic of Khakassia | 5.4             | Republic of Altai |
| Republic of Altai                                 | 5.4             | Yaroslav region  | 4.4             | Republic of Altai |
| Republic of North Ossetia                         | 5.1             | Republic of Karelia | 3.7             | Republic of Altai |
| Magadan region                                    | 4.9             | Chechen Republic | 3.3             | Republic of Altai |
| Kaluga region                                     | 4.9             | Kamchatka        | 3.3             | Republic of Altai |
| Chuvash Republic                                  | 4.5             | Tambov region    | 3.1             | Republic of Altai |
| Chechen Republic                                  | 4.3             | Kirov region     | 2.9             | Republic of Altai |

Table 5: Regions with the highest number of HIV positive donors in 2012 and 2013.

| Region                                           | 2012            | 2013            | 2012            | 2013            |
|--------------------------------------------------|-----------------|-----------------|-----------------|-----------------|
| Republic of Ingushetia                            | 51.6            | Republic of Tuva | 87.4            | Republic of Tuva |
| Chechen Republic                                  | 45.7            | Chuvash Republic | 44.0            | Republic of Altai |
| Republic of Altai                                 | 45.4            | Kamchatka        | 42.7            | Republic of Altai |
| Kaluga region                                     | 43.2            | Chechen Republic | 32.1            | Republic of Altai |
| Magadan region                                    | 42.1            | Republic of Khakassia | 31.7            | Republic of Altai |
| Republic of Karelia                               | 40.0            | Republic of Adygeya | 28.2            | Republic of Altai |
| Republic of Tuva                                  | 37.4            | Astrakhan region | 22.5            | Republic of Altai |
| Orel region                                       | 35.9            | Voronezh region  | 22.1            | Republic of Altai |
| Republic of North Ossetia                         | 32.0            | Stavropol region | 22.0            | Republic of Altai |
| Amur region                                       | 30.0            | Republic of Dagestan | 19.9            | Republic of Altai |

Table 6: Regions with the highest ratio of HIV detectability among donors and other categories examined in 2012 and 2013.

| Region                                           | 2012            | 2013            | 2012            | 2013            |
|--------------------------------------------------|-----------------|-----------------|-----------------|-----------------|
| Republic of Ingushetia                            | 51.6            | Republic of Tuva | 87.4            | Republic of Tuva |
| Chechen Republic                                  | 45.7            | Chuvash Republic | 44.0            | Republic of Altai |
| Republic of Altai                                 | 45.4            | Kamchatka        | 42.7            | Republic of Altai |
| Kaluga region                                     | 43.2            | Chechen Republic | 32.1            | Republic of Altai |
| Magadan region                                    | 42.1            | Republic of Khakassia | 31.7            | Republic of Altai |
| Republic of Karelia                               | 40.0            | Republic of Adygeya | 28.2            | Republic of Altai |
| Republic of Tuva                                  | 37.4            | Astrakhan region | 22.5            | Republic of Altai |
| Orel region                                       | 35.9            | Voronezh region  | 22.1            | Republic of Altai |
| Republic of North Ossetia                         | 32.0            | Stavropol region | 22.0            | Republic of Altai |
| Amur region                                       | 30.0            | Republic of Dagestan | 19.9            | Republic of Altai |

The drawback of this study is generalization of the results of new and regular donor examination. Usually the blood service identifies two infection safety indicators: blood transmission infection incidence and occurrence rate. Incidence, or prevalence, is the number of cases of a certain disease among the population at a certain moment. In blood transfusion it means the number of diseases among new donors (usually, per annum).
Occurrence rate is the number of cases of a disease occurring during a certain period of time in a certain population. In blood transfusion it means disease finding in regular donors [6].

In this study it is not possible to differentiate between the results for new and regular donors.

HIV detectability in donors demonstrates positive correlation with all parameters of blood rejection rate using blood transmitted infection markers (Table 8). The only exception is the blood rejection rate on HBs antigen, where no correlation is present. We may assume the identity of transmission mechanisms of HIV, HCV and syphilis as well as liver lesions as a result of alcohol consumption among persons with deviant behaviour who apply to a donor point. Positive HIV test results are more common for large regions and centres with the highest blood collection rates.

**Conclusions**

1. It was found that among different contingents the minimum detection rate of HIV infection in regions of the Russian Federation in 2013 has been registered among blood donors.

2. Maximum detection rate of HIV among men practicing sex with men actualizes the need for a ban on their participation in blood donation.

3. The detection rate of HIV among donors, as well as the ratio of detection of HIV among donors and other categories surveyed indicate a lack of efficiency of formation of donor contingent of supporters of a healthy lifestyle.

4. A direct positive correlation detection of HIV in blood donors and region population, the volume of blood processing, as well as all volumes of blood wastage due to markers of bloodborne infections except the volume due to HBs-antigen.

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**Table 7:** Correlation relationship of HIV detectability in donors and other groups examined.

| Parameter | 2012 | 2013 |
|-----------|------|------|
| Non-donors | 0.71 | 0.82 |
| People examined due to clinical signs | 0.65 | 0.80 |
| Pregnant women | 0.68 | 0.79 |
| Drug addicts | 0.51 | 0.69 |
| People with sexually-transmitted infections | 0.57 | 0.52 |
| Persons in detention | 0.26 | 0.47 |
| Medical staff working with HIV-positive patients or materials containing HIV | 0.28 | 0.24 |
| Examined during epidemiologic investigation | 0.05 | 0.11 |
| Foreign subjects examined | 0.11 | 0.10 |

**Table 8:** The strongest (r>0.39) correlation relationship of HIV detectability in donors with other donorship parameters in 2013 (p<0.05).

- Blood rejection due to ALT, l
- Absolute rejection, l
- Blood rejection due to syphilis, l
- Blood rejection due to other reasons, l
- Blood plate concentrates obtained, doses
- Red blood cells produced, l
- Plasma spent for blood components, l
- Blood rejection due to HIV, l
- Blood rejection due to HCV, l
- Cell production for blood components, l
- Cell production by centrifugation, l
- Cell production from blood, l
- Population of the RF constituent territory
- Positions involved in blood collection

The strongest (r>0.39) correlation relationship of HIV detectability in donors with other donorship parameters in 2013 (p<0.05).