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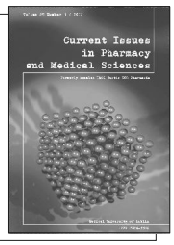

Prevalence of viruses HBV, HCV and HIV in blood donors at the Regional Centre of Blood Donation and Blood Treatment in Poznan in the years 2008–2010

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ABSTRACT

Currently we may observe increasing demand for blood and its components as well as blood derivatives. Technological progress in viral diagnostics and the use of Good Manufacturing Practice (GMP) rendered the blood safety. However, there still exists a risk connected with pathogen transmission via blood from donor during window period or being a carrier of microorganism, for which routine diagnostics are not performed. Therefore, constant education of blood donors concerning ways of pathogens transmission is required. In order to direct efficiently educational effort, it is necessary to know the risk groups of donors. The above analysis concerned donors who donated blood and its components at RCKiK in Poznan between 2008 and 2010. Donors were characterized according to sex and age; in addition, the number of detected HBV, HCV and HIV infections was determined. Analyses showed that the most numerous group (approx. 50%) of donors were young people aged 18-29 years. Men constituted as many as 73% of donors. The most frequently detected viruses were HBV (52% of cases) and HCV (45% of cases). HBV and HIV viruses were more frequently detected in men, whereas HCV in women. More than a half (51%) of infections was found in the age group 18-24 years. It was unfortunately impossible to display specific trends due to short term of analyzed results.

Keywords: blood donors, blood safety, blood-borne infection factors

INTRODUCTION

Blood and its components are the most often used therapeutic agents. In Poland over 1.2 million donations of blood and its components as well as more than 1.5 million transfusions are given every year [1, 2]. Advances in medicine and aging of society increase the demand of blood and its components [12]. Fortunately, the number of donations increases steadily. Every donor is subject to rigorous selection criteria according with appropriate regulations [15, 16]. Blood donations are voluntary and unpaid (honorary) [4, 20, 22]. The ratio of detected infections is assumed higher in paid donors than honorary [18]. Polish donors, as confirmed in research, donate blood mainly from altruistic reasons [20]. The selection of donors and serological and molecular screening towards HBV, HCV, HIV, and syphilis markers ensure blood safety. Moreover, grace period for plasma and cryoprecypitate as well as leukoreduction and in limited extent - pathogen inactivation in blood components, are used. Diagnostic methods of blood and its components and pathogen inactivation are constantly improved. Having still in mind serological window period, the selection of donors is very important as well. Such a selection is made by applying donor questionnaire [6] and medical history taking. However, the basis for success at this stage is high donor awareness and the level of their education. According to research results, donors' knowledge concerning infectious agents for blood-borne transmission is low [20].

The common goal of all analyses and comparisons in this paper was to determine and characterize population of donors who donated blood and its components at the *Regional Centre of Blood Donation and Blood Treatment* (RCKiK) in Poznan between 2008 and 2010, as well as the number of viral infections detected in samples. In addition, specific trends in the numbers of detected infections in analyzed groups were investigated according to donors' age and sex. There was no division of donors into subgroups (first-time donors and repeated donors). The number of detected viral infections among repeated donors is known to be considerably lower comparing to first-time donors due to higher awareness and education level [20].

Determining high-risk groups could play an important role in increasing transfusion safety at the stage of donors' selection. This can be achieved by prophylactic and targeted informative and educational actions and activities. The above-described actions would influence and increase safety of used blood components as well as decrease the cost of blood components preparation and diagnostics, which currently in case of positive results are destroyed [20].

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MATERIALS AND METHODS

The research comprised donors who donated whole blood or its components for clinical purposes in RCKiK in Poznan between 2008 and 2010. Only confirmed HBV, HCV and HIV infections were included, which resulted in disqualification of donors [7, 18]. Age and sex of donors were considered in further analysis.

In order to facilitate all the comparisons, a number of infected donors was presented as the number of infected donors per 100,000 donors. The number of infected donors was divided by total number of donors in the respective group and multiplied by 100,000. Screening analysis and confirmation tests were performed according valid blood donating algorithms [2, 7].

In screening diagnostics HIV 1/2 Ab/Ag and HIV RNA, Ab HCV and HCV RNA, HBsAg and HBV DNA, were analyzed. In case of positive serological screening, confirmation tests were performed. Donors infected with HBV were determined by detection in their samples of HBsAg and/or HBV DNA. Donors infected with HCV were determined by detection of anti-HCV antibodies and/or HCV RNA, whereas HIV infected donors were determined by detection of anti-HIV antibodies and/or HIV RNA [7].

From the beginning of 2008 up to 7th of February 2010 in serological screening Abbott company tests were used: for HBV – HBsAg Qualitative test, HCV – anti-HCV test and for HIV - HIV Ag/Ab Combo test detecting antibodies and antigens (p24). From 8th of February onwards Ortho Clinical Diagnostics tests were used, respectively: HBV – HBsAg ES, HCV – anti-HCV and HIV – anti-HCV (detecting only antibodies).

Screening NAT analyses (between 2008 and 2010) were performed in pooled plasma samples from 6 donations using Roche multiplex Cobas TaqScreen MPX test. In case of pool positive result, Cobas TaqScreen MPX was performed on individual samples forming this pool. After detection of positive donation in pool, discrimination tests were performed: Roche Cobas AmpliPrep TaqMan HCV test, Cobas AmpliPrep TaqMan HBV test, Cobas AmpliPrep TaqMan HIV test.

In case of positive serological screening, confirmation tests were performed. In the event of HCV – neutralization test and Cobas TaqMan HBV test (detecting virus genetic material) were performed. In case of HCV virus, genetic material was detected using Cobas TaqMan HCV test, and in case of negative result, supplemental tests were performed in the Institute of Hematology and Transfusiology in Warsaw (IHiT) (RIBA HCV test – Chiron and from 4th of May 2010 InnoLia HCV Score test – Innogenetics). In case of HIV, samples were sent to IHiT in order to perform supplementary test (WB – Genelabs and from 20th of June 2010, InnoLia test – Innogenetics) and test towards genetic material detection. All analyses were performed in RCKiK in Poznan except supplementary tests towards HCV and HIV, which were performed in IHiT.

RESULTS

The total of 148,320 donors donated blood for clinical purposes during 2008-2010. Among them, men were a majority (73%), although proportion of women in the analyzed period increased. The most numerous group of donors comprised young persons (18-29 years old) constituting approx. 50% of donors, and their percentage increased. The least numerous group of donors was formed by donors over 65 years old age. In age group over 40 years, slight but steady decrease in the number of donors was observed.

Table 1. Donors permanently disqualified due to HBV, HCV and HIV infection in 2008-2010 and their percentage

Year	Donors disqualified due to infection with:						Non-infected donors		Donors in total (100%)
	HBV		HCV		HIV				
	Number	%	Number	%	Number	%	Number	%	
2010	72	0.15	72	0.15	4	0.01	49172	99.70	49320
2009	69	0.13	55	0.11	8	0.02	51194	99.74	51326
2008	85	0.14	66	0.18	1	0.00	47522	99.68	47674

In years 2008-2010, 432 donors in total were disqualified due to HBV, HCV and HIV infections, which constituted 0.3% of donors. The most frequently detected virus was HBV (52.31%) and HCV (44.68%). The number of HIV infections comparing to HBV and HCV was low (3.01%).

Table 2. Number of female and male donors in whom HBV, HCV or HIV infections were detected

Year	Sex of donor	Number of donors	Number of confirmed infections			Number of confirmed infections per 100,000 donors		
			HBV	HCV	HIV	HBV	HCV	HIV
2010	Total	49320	72	72	4	146.0	146.0	8.1
	Women	13534	11	25	0	81.3	184.7	0.0
	Men	35786	61	47	4	170.4	131.3	11.2
2009	Total	51326	69	55	8	134.4	107.2	15.6
	Women	13754	9	16	2	65.4	116.3	14.5
	Men	37572	60	39	6	159.7	103.8	16.0
2008	Total	47674	85	66	1	178.3	138.4	2.1
	Women	12227	26	18	0	212.6	147.2	0.0
	Men	35447	59	48	1	166.4	135.4	2.8
2008--2010	Total	148320	226	193	13	152.4	130.1	8.8
	Women	39515	46	59	2	116.4	149.3	5.1
	Men	108805	180	134	11	165.4	123.2	10.1

HBV virus was occurring more frequently in men, whereas HCV in women. The number of HBV infections in 2008 and HCV infections in 2010 per 100,000 donors was higher in women that in men. However the number of HIV

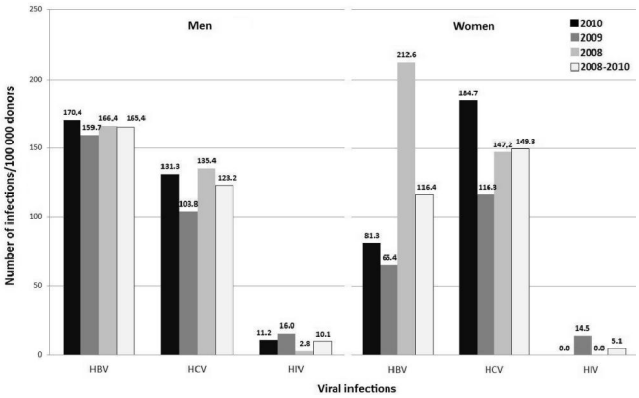

Fig. 1. Number of detected HBV, HCV and HIV infections in men and women in 2008-2010 period

infections was twice as high in men that in women. Moreover, there were no HIV infections detected in women in 2008 and 2010 respectively.

Table 3. Number of donors in respective age groups in whom HBV, HCV or HIV infections were detected

Year	Age of donors	Number of donors	Number of confirmed infections			Number of confirmed infections per 100,000		
			HBV	HCV	HIV	HBV	HCV	HIV
2008--2010	18-24	44275	120	94	6	271.0	212.3	13.6
	25-29	30641	16	32	3	52.2	104.4	9.8
	30-34	22494	30	22	1	133.4	97.8	4.4
	35-39	17355	20	7	2	115.2	40.3	11.5
	40-44	11705	12	16	1	102.5	136.7	8.5
	45-49	8369	15	17	0	179.2	203.1	0.0
	50-54	7131	8	4	0	112.2	56.1	0.0
	55-59	4528	4	1	0	88.3	22.1	0.0
	60-64	1716	1	0	0	58.3	0.0	0.0
	65	106	0	0	0	0.0	0.0	0.0

HBV, HCV and HIV viruses were detected predominantly in young people aged 18-24 years, constituting 51% of all viruses detected. The greatest number of HBV infections was found among donors aged 18-24 and 45-49 years. HCV virus was also detected most often in groups of donors aged 18-24 and 45-49 years. The number of HIV infections was lower comparing to HBV and HCV infections. Moreover no HBV infections were detected in donors over 65 years old age, HCV infections in donors over 60 years and HIV in donors over 45 years of age.

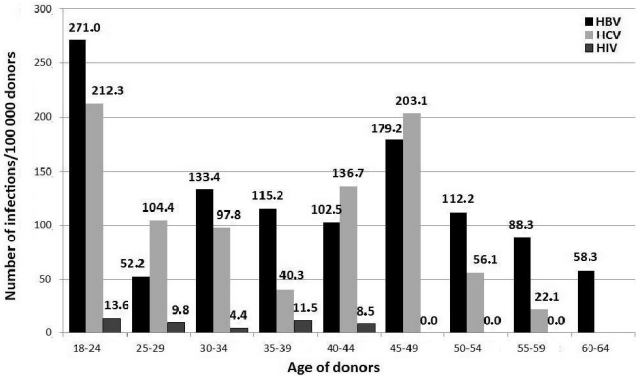

Fig. 2. Ratio of diagnosed HBV, HCV and HIV infections during 2008-2010 in respective age groups per 100,000 donors

DISCUSSION

Blood and its components are life-saving medicines. Therefore, a great pressure is put on their quality and safety. The main priority is to lower the transmission risk of the most common viral agents i.e. HBV, HCV, and HIV [12]. Greater Poland is a region with a medium level of endemicity of HBV, HCV and HIV occurrence [14, 18, 19].

Among donors, men predominated (73%) as well as 18-29 year-old people (approx. 50%); moreover, the percentage of the latter increased. Evidently, it is due to the increasing number of field teams, for which a target group are pupils and students [13]. HBV, HCV, and HIV viruses were detected most frequently in young people group aged 18-24 years. As much as 51% of viruses were found in this group. HBV was the most frequently detected among donors in age groups 18-24 and 45-49 years, respectively. In addition, HCV was the most frequently detected among donors in age groups 18-24 and 45-49 years, respectively. Abovementioned virus detection data applies to comparable results obtained nationwide [10]. HBV and HIV viruses are usually sexually transmitted; therefore, it is not surprising that they occur predominantly in a group covering young people, whose sexual activity is high. Also intravenous transmission mode in drug-using young people may not be excluded [10, 11, 23].

HBV was the most frequently detected virus among donors at RCKiK in Poznan. However, no visible trend was observed. Until recently, Poland was a country with increased Hepatitis B morbidity. The number of infections was lowered due to obligatory vaccinations and raising of procedural standards involving manipulations causing skin injuries [2]. Among Polish donors, the decrease in HBV infections has been observed for several years [5, 9, 19].

HCV infections are worldwide issue and at the same time the most important epidemiological issue in Poland [2, 3], where, however, a decreasing morbidity trend has been observed. Among donors at RCKiK in Poznan during 2008-2010 no significant trend was observed, but infections were predominantly found in women. HCV virus is usually bloodborne during dental or cosmetic procedures, of which the latter are usually performed on women [8].

Poland is in a group of countries with low HIV/AIDS epidemic dynamics [17]. Moreover, in Greater Poland HIV detection rate was lower than a half of nationwide median. HIV detection frequency in the analysis was diverse, however concerned predominantly men. This results correlates with those obtained nationwide [14]. Predominant infection mode is the sexual transmission especially in a group of homosexual men. Lately the number of infection by hetero- sexual intercourses has also increased. Such an increase of infections is due to virus epidemic and more frequent testing of population towards HIV [17].

CONCLUSIONS

- Among blood donors from working area of RCKiK in Poznan in 2008-2010, the most numerous group were young people, aged 18-29 years, constituting approx. 50% of all donors. Their percentage was increasing whereas it was decreasing among the donors over 40 years of age.
- In the analyzed period men constitued 73% of all donors, however the percentage of female donors showed a slight positive trend.
- The most frequently detected viruses were HBV (52%) and HCV (45%).
- HBV and HIV viruses were detected more often in men (165.4 HBV infections /100,000 donors; 10.1 HIV infections /100,000 donors), whereas HCV was more frequently detected in women (149.3 HCV infections/100,000 donors).

– More than a half (51%) of viral infections was found among young donors (18-24 years old).
– For showing steady trends, three-year period was definitely too short, therefore detected infections need further observations.

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