THE ANALYSIS OF BLOOD DEFECTION AND ITS COMPONENTS IN SYSTEM OF MEASURES FOR THE PREVENTION OF INFECTION WITH TRANSFUSION AND TRANSMISSIBLE INFECTIONS

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Abstract

When carrying out a monitoring of defection of a donor blood it is established that absolute defection of a blood and its components was enlarged by 3,9 times. Thus paid donors make 7,6%, and gratuitous 92,4% of total number of absolute defection. The share of infections in structure of absolute defection averages 47,6%. Frequency of occurrence of transfusion and transmissible infections among donors makes 0,6%. Antibodies of HCV, HBS Ag, Luis in 10 times more often are taped at primary donors, than at the repeated.

Keywords: Donor, blood donation, transfusion - transmissible infections

Relevance

Questions of safety injections of components of a donor blood to recipients are one of the most difficult in transfusiology. In recent years the problem bounds to significant increase in frequency of occurrence of HIV infection and virus hepatitises B and C at donors of a blood and plasma [1,2,3,4] was taped. According to the World Health Organization (WHO), in 2011 in the world total number of the people living with HIV, makes 34,2 million people. In Kazakhstan, according to the AIDS Republican center (RCAIDS), in 2012 2015 cases of HIV infection are registered, the indicator on 100 thousand of population made 12,0 (in 2011 of-2006 cases, an indicator –12,2), in comparison with the similar period of last year , noted the growth on 9 cases. In Kazakhstan, according to the AIDS Republican center, the epidemiological situation on HIV infection as a result of systematic antiepidemic actions is in recent years stabilized and is at the concentrated stage. Level of diffusion of an infection among the population doesn't exceed 0,2% that several times below the average level in the region of Eastern Europe and Central Asia. In 2012, 2015 cases of HIV infection are registered, the indicator on 100 thousand of population made 12,0[5]**.** In structure of the HIV-infected donors 97% - the gratuitous donors, more than 90% - persons of risky behavior – consumers of the injecting drugs released from jails and having sexual contacts of raised risk [6,7]. Among the infected people, amount of people from 20 to 39 years old is 72,3%. The number of sick women to 42% was enlarged. Unemployed citizens make the taped cases of HIV infection of 63%. Among the registered HIV-infected in 38,2% cases infection was the result of injection consumption of narcotics, 57,8% - share of a sexual way of transfer**.** Despite high level of modern methods of preparation, processing, conservation and storage, immune serologic diagnostics and testing of a blood of donors on virus and bacterial agents,

to completely exclude the risk of immunologic post transfusion reactions and complications development, and also a transfer of transfusion and transmissible infections (hepatitises B, C, HIV, cytomegaloviruses) at transfusions of a donor blood isn't represented as possible [8,9,10,11,12]. Thereby recipients of components and blood preparations were insufficiently protected from transfusion and transmissible infections [13,14,15]. The majority of researchers consider asymptomatic carriers as the main source of transfer of infections, which can be potential donors with lack of any implications of disease [16,17,18]. It leads to fast diffusion of these infections in groups of high risk. The high risk of infection is characteristic for patients with a narcomania, the persons, having casual sexual communications, homosexuals, for persons with the hemotransfusionic anamnesis, and also some categories of medical workers from departments of a hemodialysis, a hematology, hemotransfusion stations. Thus the main mechanism of transfer of originators is parenteral[19,20].

For the first time the taped and again arising infectious diseases frame threat to all world community and put parts of the population of a planet serious humanitarian, economic and social injury [21,22].

Some authors bind diffusion of infectious diseases to questions of global safety [23]:

In some countries of Central Asia prevalence of parenteral infections among donors almost the same, as among the population as a whole ,which testifies to an incompetence of system of attraction and selection of donors, including a stage of laboratory screening on existence of infections. For example, prevalence of hepatitis C among donors of a blood is estimated at 3% that practically corresponds to its prevalence among the population as a whole[24,25].

The augmentation of a share of donor blood defection because of its infection not only leads to rising of cost of blood services , but also has an adverse effect on security donor blood [26]. We have carried out a monitoring of donor blood defection before donations and after donations.

Research material and methods

The object of the research is- donors who have addressed in the Center of a blood of the Pavlodar region (PRBC) during 2008-2012. The collecting of epidemiological donors data was carried out during the using the standard questionnaire approved by the order MH RK No.332 from 08.07.2009. Questionnaires were filled in on all donors who were handing over a blood or its components in stationary and visiting conditions. Social "portrait" of donors was analyzed according to the following characteristics: sex; age; became the donor for the first time, repeatedly; social status; place of residence (city, village). Besides, the ratio of "paid" and "gratuitous" donors in the Pavlodar region was studied.

The materials of study also were:

- annual reports on PRBC work from 2008 for 2012;
- log-books of laboratory results of research on HIV, virus hepatitises B and C, a lues;
- log-books of laboratory blood analyses and urine, biochemical blood analyses (protein and albuminous fractions of blood, bilirubin and hepatic assays, thymol turbidity test, bacteriological researches of materials etc.);

At a stage of laboratory screening, for IFA of HIV diagnostics of an infection (HIV), virus hepatitises In (HBsAg) and C (HCV), a lues (Luis) carried out on test system xanti-HiV "MurexHIV-1.2.0" the producer (MurexBiotechLimited, the USA), anti-HCV "Murexanti-HCV.Version 4.0" the producer (MurexBiotechLimited, the USA), HBsAg "MurexHBsAg. Version 3" producer (MurexBiotechLimited, USA), anti-Luis "ISE * Syphilis" producer (MurexBiotechLimited, USA).Inside laboratory quality control was carried out daily when using PCR. To identify VHC RNA and DNA of HBV the following

commercial sets of production of Center Scientific-Research Institute of Epidemiologywere used: in a format of real time: Amplisens HCV-FRT (qualitative test for VHC RNA), Amplisens of HBV-FRT (qualitative test for DNA of HBV), Amplisens of HCV-Monitor-FRT (quantitative test for VHC RNA), Amplisens of HBV-Monitor-FRT (quantitative test for DNA of HBV). In a format of electrophoretic detection: Amplisens hbv-470/770-BKO (qualitative test for DNA of HBV), Amplisens of HCV-240/440-BKO (qualitative test for VHC RNA, Ampli-Sens-50-RHCV-genotip" (definition of genotypes of VHC). The declared analytical sensitivity of test systems makes for Amplisens of HCV-FRT - 100 ME/ml, for Amplisens of HCV-240/440-BKO – 1000 ME/ml, for Amplisens of HBV-FRT – 100 repetitions/ml, for Amplisens of HBV-470/770-BKO - 1000 repetitions/ml. Linear range of measurement of test system of Amplisens of HCV-Monitor-FRT - 500–50 million. ME/ml, Amplisens of HBV-Monitor-FRT - 300–100 million repetitions/ml.

Results of the research

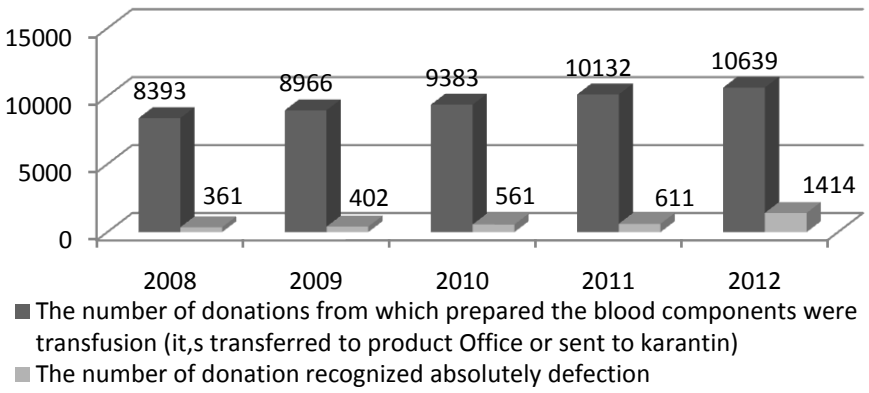
On the average 3420 people (22,4%) aren't allowed to donations, 66,1% from them are denied by the doctor 19,3% according to results of primary laboratory research , 11,6% are the share of data of the uniform donor information center (UDIC) and 3% for other reasons. Data are presented in table 1.

Table 1 - Monitoring of data on removal of donors before donations

Year	**2008**	**2009**	**2010**	**2011**	**2012**
1	**2**	**3**	**4**	**5**	**6**
Population of the area	742,9	748,8	748,8	748,8	748,8
Total addresses	13 139	15 347	16 130	16 389	15 418
Taken away the addresses at a stage before donation of a blood and its components, total	3 349	3 437	3 488	3 461	3 365
Discharge share at a stage before donation of a blood and its components (%)	25,5%	22,4%	22%	21%	22%
from them, according to UDIC	504	490	246	372	366
Discharge share according to UDIC from total number of detached (%)	15,0%	14,3%	7,1%	10,7%	10,9%
from them, by the doctor on appointment	2 170	2 486	2 655	2 299	1 699
Share of discharge by the doctor on appointment from total number of detached (%)	64,8%	72,3%	76,1%	66,4%	50,5%
from them, by results of primary laboratory inspection	499	398	585	790	1 022
Discharge share by results of primary laboratory inspection from total number of detached (%)	14,9%	11,6%	16,8%	22,8%	30,4%
from them, for other reasons	176	63	2	0	278

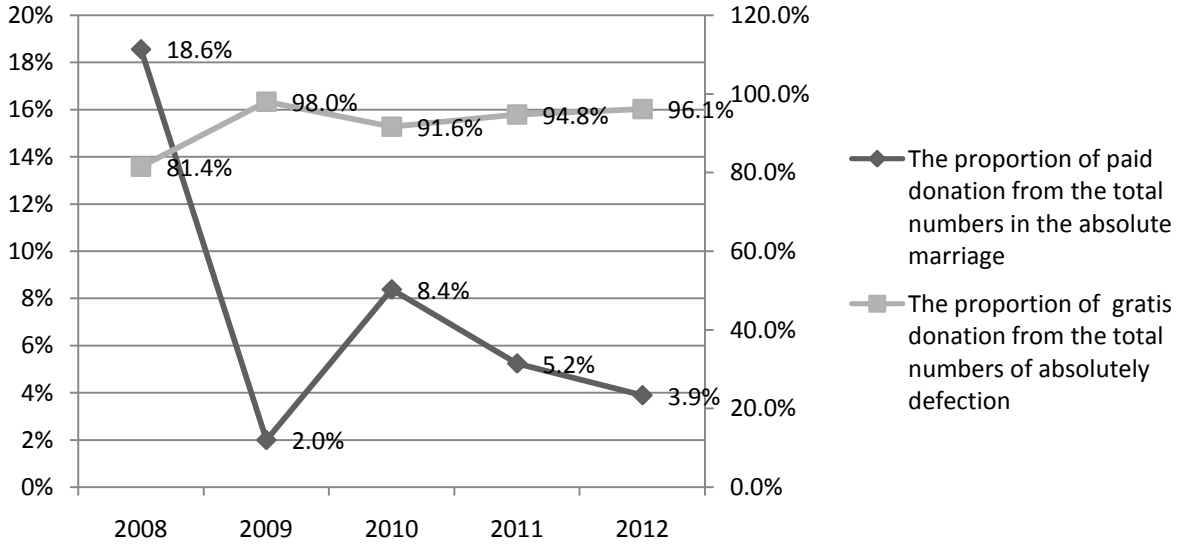
According to the table 1 it is visible that the number of the donors who haven't been allowed before donations according to UDIC, decreases every year and the last two years of observation are made by 10,8%. Whereas the share discharged by results of primary laboratory analysis was enlarged from 14,9% in 2008 to 30,4% for 2012. This situation speaks about imperfect system of UDIC. The share of donors discharged after an appointment also decreases, but remains rather high. This fact can be correlated to that the larger percent of 71,6% is made by age group from 18 to 39 years from which workers 51% fall to the share that shows low level of preventive examinations.

After a blood sampling at the allowed donors to donation testing of components of a blood for transfusion-transmissible infections in the conditions of PRBC laboratory is held. Allocate absolute defection and relative defection of a donor blood and its components. Dynamics of indicators of absolute defections in five years is presented in picture1.



Picture 1 - Dynamics of absolute defection indicators

In the analysis of indicators of absolute defection of a blood and its components it is visible that indicators of 2012 were enlarged by 3,9 times in comparison with 2008. The share of absolute defections averages 5,6%, but the tendency of defections height speaks about bad detectability at a stage before blood donation. Thus paid donors make 7,6%, and gratuitous 92,4% of total number of absolute defection (picture 2).



Picture 2 - Share of paid and gratuitous donors in structure of absolute defection

Highlighting the questions of virus safety, first of all, consider the questions bound to possible transfer of viruses of hepatitises – B and C (HCV, HBS Ag). From all virus hepatitises on globality of diffusion, a high infection of the population -70-30%, frequencies of synchronization of process – 8% of the population of Kazakhstan, are the hepatitis B27,28. At this research, as for registration of a marker of hepatitis B, the share surveyed in which HBS Ag is found, even decreased for years of observation: if in 2008 this share was about 11,1%, in 2012 only hepatitis B markers are found in 4,8%, the peak fell on 2009 when the share of positive results made 15,7% of total number of absolute defection (picture 3).

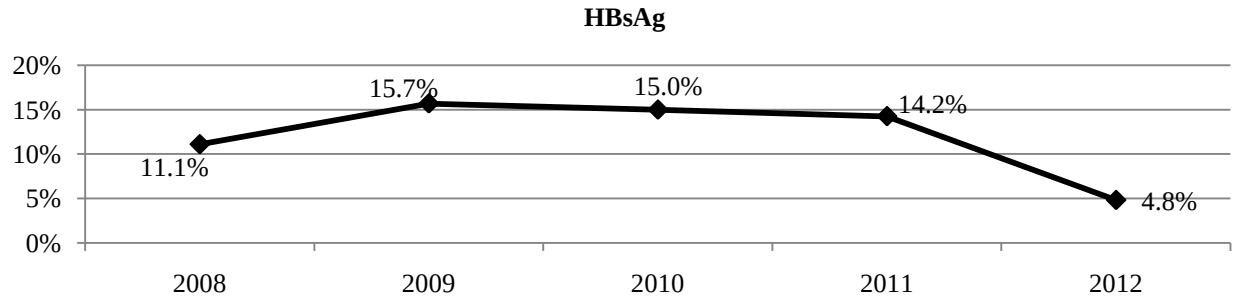
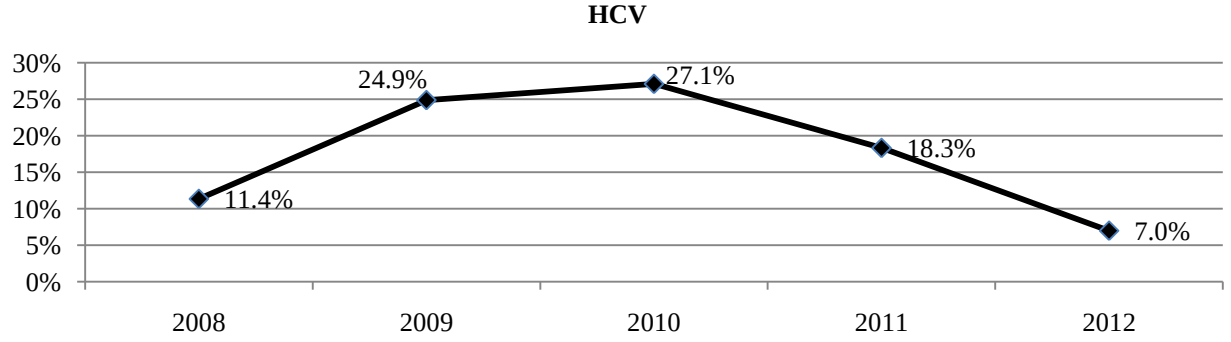


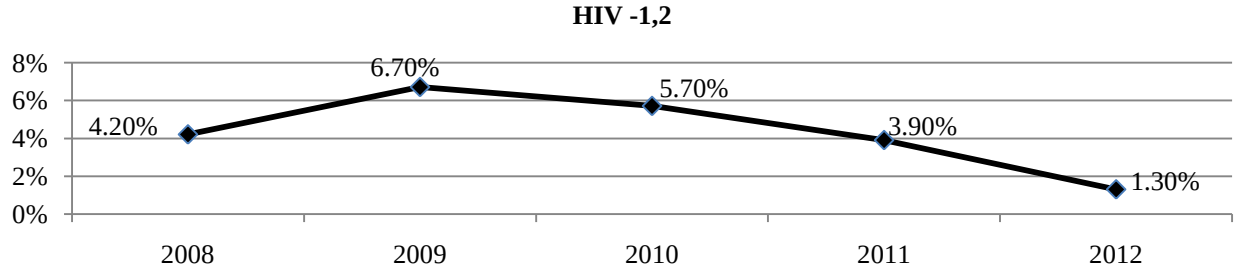
Figure 3 - Share of detection of HBS Ag markers in structure of absolute defection

If to compare the frequency of occurrence of markers of hepatitises B and C, it is visible that the share of detection of hepatitis C is slightly bigger from number of absolute defection, but also the tendency to reduction, so in 2008 11,4% are identified, and in 2012 of 7% of total number of absolute defection, the peak of growth is on 2010 – 27,1% (Picture 4).



Picture 4 - Detection share of HCV markers in the structure of absolute defection

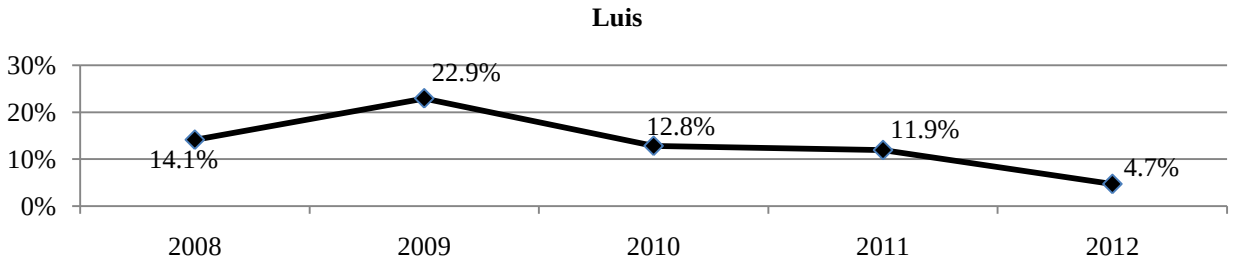
The infection most terrible and more extending in the world, which can be transferred with blood, is AIDS. The share of the infected blood of donors of HIV 1,2 (HIV) in structure of absolute defection is presented in picture 5.



Picture 5 - Share of detection of markers of HIV 1,2 in structure of absolute defection

On the chart (picture 5) it is visible that there is an accurate tendency to depression of a share of HIV 1,2, in structure of absolute defection since 2009 when the indicator was 6,7%, and 2012 it became 1,3%.

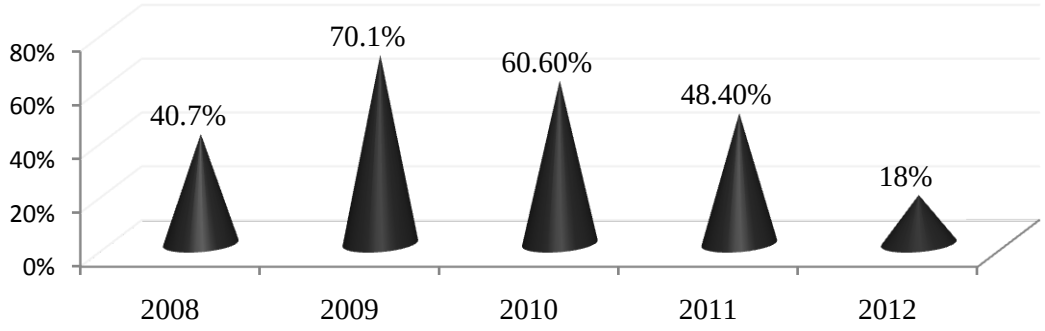
Lues diffusion became a serious medico-social problem recently: according to materials of Ministry of Health of the Republic of Kazakhstan, in 2010 the case rate a lues made 34,5 on 100 thousand people of the population, and the disease is characterized by prevalence of the hidden forms, atypical implications and fastness to therapy. The share of detectability of markers of a lues in structure of absolute defection is presented in picture 6.



Picture 6 - Share of detection of lues markers in structure of absolute defection

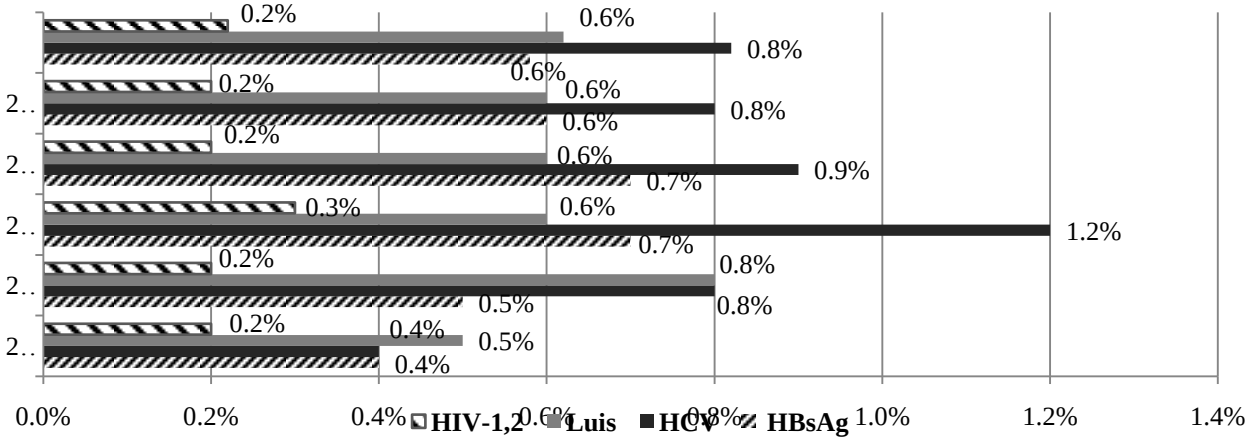
In this case, as there is a depression of a share of an infection by a lues in structure of absolute defection since 2009 when the peak reached 22,9% to 4,7% of positive results in 2012 (picture 6).

Thus, the share of infections in structure of absolute defection averages 47,6%. Thus, the share of infections in structure of absolute defection averages 47,6%. The peak of growth identification of transfusion and transmissible infections after donations falls on 2009-2010 (picture 7).



Picture 7 - Share of infections in structure of absolute defection

During research, from 2008 to 2012, prevalence of markers of transfusion and transmissible infections among donors of the Pavlodar region as a whole the tendency to depression of number of the infections which peak fell on 2009-2012 is observed. HCV markers are identified more often, then follow HBS Ag, Luis , and here markers of HIV are defined 2-4 times less often (picture 8).



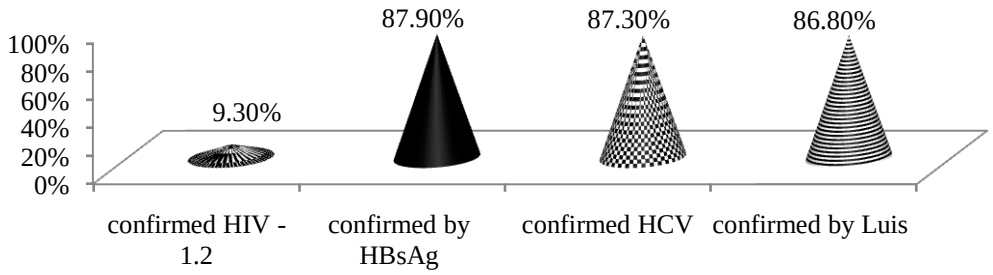
Picture 8 - Frequency of occurrence of transfusion and transmissible infections among donors of the Pavlodar region

Blood of donors on transfusion and transmissible infections are investigated twice, all initially positive results are sent for repeated research. Data of the repeated research of a donor blood are provided in table 2.

Table 2 - Data of repeated research of a donor blood and its components on transfusion and transmissible infections

Year	2008	2009	2010	2011	2012
Number of donations of a blood and its components	9790	11910	12642	12928	12053
Initially positive (or "a gray zone") HIV-1,2	15	27	32	24	19
from them, it is confirmed with HIV-1,2	1	2	3	3	2
Initially positive (or "a gray zone") HBsAg	40	63	84	87	68
from them, HBsAg is confirmed	40	57	77	68	54
Initially positive (or "a gray zone") HCV	41	100	152	112	99
from them, HCV is confirmed	41	97	106	86	92
Initially positive (or "a gray zone") on a lues	51	92	72	73	67
from them, it is confirmed on a lues	50	88	60	59	51

By data given in table 2 it is visible that the greatest number of confirmations of an infection of donors becomes perceptible HCV, HBS Ag, Luis. HIV is more rare. The share of the confirmed results on existence in a blood of donors of markers of HCV averaged 87,3%, HBsAg - 87,9%, Luis of 86,8% and HIV-1,2 – 9,3% (figure 9).



Picture 9 - Share of the confirmed results on transfusion and transmissible infections among donors of the Pavlodar region

One of the factors of the increased risk of transfer of transfusion and transmissible infections according to the series of authors [29], are primary donors - as a rule, people of younger age. We studied detectability of markers of transfusion and transmissible infections at the active donors who are constantly handing over a blood of 5-6 times a year, and for the first time come to hand over a blood. Data are provided in table 3.

Table 3 - Data of inspections of donors on existence of antibodies to transfusion and transmissible infections

Markers	Year		2008	2009	2010	2011	2012
	Total amount of donors, n		n=9790	n=11910	n=12642	n=12928	n=12053
HIV 1,2	Primary donors	abs.	14	25	29	24	19
		%	0,14%	0,21%	0,23%	0,19%	0,16%
	Repeated donors	abs.	1	2	3	0	0
		%	0,01%	0,02%	0,02%	0	0
HBsAg	Primary donors	abs.	36	57	76	78	61
		%	0,37%	0,48%	0,60%	0,60%	0,51%
	Repeated donors	abs.	4	6	8	9	7
		%	0,04%	0,05%	0,06%	0,07%	0,06%
HCV	Primary donors	abs.	37	90	137	101	89
		%	0,38%	0,76%	1,08%	0,78%	0,74%
	Repeated	abs.	4	10	15	11	10

	donors	%	0,04%	0,08%	0,12%	0,09%	0,08%
Luis	Primary donors	abs.	46	83	65	66	61
		%	0,47%	0,70%	0,51%	0,51%	0,51%
	Repeated donors	abs.	5	9	7	7	6
		%	0,05%	0,08%	0,06%	0,05%	0,05%

From data of table 3 it is visible that antibodies of HCV, HBS Ag, Luis in 10 times more often are taped at primary donors, than at the repeated ones. According to research, 0,75% of primary donors are infected with hepatitis C, further on detectability of antibodies to transfusion and transmissible infections are a lues – 0,54% of primary donors and hepatitis B – 0,51% of primary donors. Wasn't an exception and identification of antibodies to HIV: in most cases they were taped only at initially surveyed donors in 0,19% of cases. Our results confirm the opinion, that primary donors are a factor of the increased risk of transfer of transfusion and transmissible infections.

Conclusion

Therefore, an absolute defection of blood and its components was enlarged by 3,9 times in comparison with 2008. Thus paid donors make 7,6%, and gratuitous 92,4% of total number of absolute defection. The share of infections in structure of absolute defections averages 47,6%. The peak of identification growth of transfusion and transmissible infections after donations falls on 2009-2010. Frequency of occurrence of transfusion and transmissible infections among donors makes 0,6%. HCV markers – 0,8% are identified more often, then goes HBS Ag, Luis – 0,6% , and here markers of HIV are defined 2-4 times less often – 0,2%. The share of the confirmed results on existence in a blood of donors of markers of HCV made 87,3%, HBsAg - 87,9%, Luis of 86,8% and HIV of-1,2 - 9,3%. Antibodies of HCV, HBS Ag, Luis in 10 times more often are identified at primary donors, than at the repeated ones.

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