

University of Groningen

## Epidemiological Aspects of Hepatitis B and C Markers in Blood Donors in Kazakhstan; 2000-2011

Igissinov, Nurbek; Kulmirzayeva, Dariyana; Smit Sibinga, Cees Th.; Turgambayeva, Asiya

*Published in:*  
Iranian Journal of Public Health

**IMPORTANT NOTE: You are advised to consult the publisher's version (publisher's PDF) if you wish to cite from it. Please check the document version below.**

*Document Version*  
Publisher's PDF, also known as Version of record

*Publication date:*  
2014

[Link to publication in University of Groningen/UMCG research database](#)

*Citation for published version (APA):*

Igissinov, N., Kulmirzayeva, D., Smit Sibinga, C. T., & Turgambayeva, A. (2014). Epidemiological Aspects of Hepatitis B and C Markers in Blood Donors in Kazakhstan; 2000-2011. *Iranian Journal of Public Health*, 43(2), 156-161.

**Copyright**

Other than for strictly personal use, it is not permitted to download or to forward/distribute the text or part of it without the consent of the author(s) and/or copyright holder(s), unless the work is under an open content license (like Creative Commons).

**Take-down policy**

If you believe that this document breaches copyright please contact us providing details, and we will remove access to the work immediately and investigate your claim.

*Downloaded from the University of Groningen/UMCG research database (Pure): <http://www.rug.nl/research/portal>. For technical reasons the number of authors shown on this cover page is limited to 10 maximum.*



## **Epidemiological Aspects of Hepatitis B and C Markers in Blood Donors in Kazakhstan; 2000-2011**

**\*Nurbek IGISSINOV<sup>1,2</sup>, Dariyana KULMIRZAYEVA<sup>2,3</sup>, Cees Th. Smit SIBINGA<sup>4</sup>, Asiya TURGAMBAYEVA<sup>3</sup>**

1. *Research Institute of Traumatology and Orthopedics, Astana, Kazakhstan*
2. *PA "Central Asian Cancer Institute", Astana, Kazakhstan*
3. *JSC "Astana Medical University", Astana, Kazakhstan*
4. *Faculty of Medical Sciences, University of Groningen, Netherlands*

**\*Corresponding Author:** Tel: +77024293421 Email: n.igissinov@gmail.com

(Received 18 Aug 2013; accepted 15 Nov 2013)

### **Abstract**

**Background:** Transfusion-transmissible infections such as hepatitis B and hepatitis C are among the greatest threats to blood safety for transfusion recipients and pose a serious public health problem. The aim of this study was to assess the epidemiological aspects of hepatitis B and C in Kazakhstani donor's blood over the period 2000-2011.

**Methods:** The data were obtained from the annual reports of the Republican Blood Center. The retrospective study was conducted from 2000 to 2011.

**Results:** Over the study period in the republic a growth of volumes of procured blood from 312.4 to 398.0 units was noted, in total equalled to 4,277.8 units. The proportion of blood wasted increased from 8.3% to 8.7%. In the dynamics the proportion of viral hepatitis among all causes of blood wasted decreased from 29% to 15.5% (HBV) and from 33.5% to 9.9% (HCV). The proportion of HBV and HCV in whole blood decreased considerably, in plasma and red cell concentrate the rates changed slightly. The average annual prevalence of HBV and HCV were 2.1% and 1.8%, respectively.

**Conclusion:** Despite the reduction of viral hepatitis rates among blood donors in Kazakhstan the prevalence still remains high. The HBV prevalence is higher compared to HCV, which needs further investigations in the general population to address the issue.

**Keywords:** Blood donors, Hepatitis B virus, Hepatitis C virus, Kazakhstan

### **Introduction**

Blood donations save millions of lives. However, unsafe transfusion practices put millions of people at risk for transfusion-transmissible infections (TTIs) (1). Indeed, with every unit of blood, there is a residual risk to become infected with a TTI agent, including mainly hepatitis B virus (HBV), hepatitis C virus (HCV), human immunodeficiency virus (HIV), and syphilis (2). The first association of hepatitis with blood transfusion was in

1943 (3). Today HBV infection is one of the most spread infections. Approximately 2 billion of world's population has been infected and about 400 million (5% of the world's population) have chronic infection, more than 50 million people infected annually (4, 5). HCV infection is another common chronic infection, averaging 2-3% or 200 million persons globally (6, 7). Despite the significant reduction of the infection transmission risk

over the past 20 years due to the selection of blood donors with low TTI marker risk followed by effective laboratory screening (8, 9), the risk of TTIs still remains a major concern (10).

Kazakhstan is a post-Soviet newly independent country located in Central Asia, divided into 16 geographical-administrative areas (14 regions and the cities of Astana and Almaty). Blood safety in the republic in respect of transmission of infectious diseases is safeguarded by legislation that prescribes the selection of donors, both by pre-donation questioning and serological testing. In accordance with international requirements, blood donors undergo mandatory screening tests for the presence of antibodies to HCV, HIV and syphilis, and HBV antigen. Donors who are reactive and/or positive are deferred and excluded (11).

Another way of ensuring blood safety is identification and retention of healthy blood donors (12), especially regular voluntary non-remunerated low-risk donors (13). In most developing and transitional countries family/replacement and paid blood donors are still a significant source of blood for transfusion (14). However, the possibility of contracting hepatitis is much higher among family/replacement donors (15-17), and paid donors (18).

The objective of this study was to assess the epidemiological aspects of Hepatitis B and C in donor's blood over the period 2000-2011.

## **Materials and Methods**

The annual reports on the blood donations in the republic (form N39) compiled by the Republican Blood Center were extracted from the database of the Ministry of Health of the Republic of Kazakhstan. The data on the prevalence of HBV and HCV among donor's blood were obtained. Data of the Agency of Statistics on the population of Kazakhstan and on the incidence of viral hepatitis were used (19). The time frame covers the period from 2000 to 2011.

Our study describes the prevalence of hepatitis in whole blood, as well as in red cell concentrate and plasma, which are produced by method of plasma-

phoresis and cytophoresis (20). After collecting a whole blood a small portion of it is left, the majority is processed in blood components.

According to the law of the Republic of Kazakhstan «About State Statistics» (21), the information in the summary report is confidential and may only be used for statistical purposes. The information may be shared for research purposes only if a requesting organization provides the data security and undertakes all the necessary actions in making unable the identity of respondents, in concordance with the Principles of the World Medical Association (WMA) Declaration of Helsinki – Ethical Principles for Medical Research Involving Human Subjects, adopted by the 18th WMA General Assembly in Helsinki, Finland, in June 1964.

In the study different methods of biomedical statistics were used – extensive and intensive indexes, average value, mean error, 95% confidence interval and the average annual growth/decline rate ( $T$ , %) (22). The method of map compiling was used, based on the calculation of the standard deviation ( $\sigma$ ) from the mean ( $x$ ) (23). When grouping a parametrical row for modeling equal intervals the formula proposed by Boyarsky (24) was used.

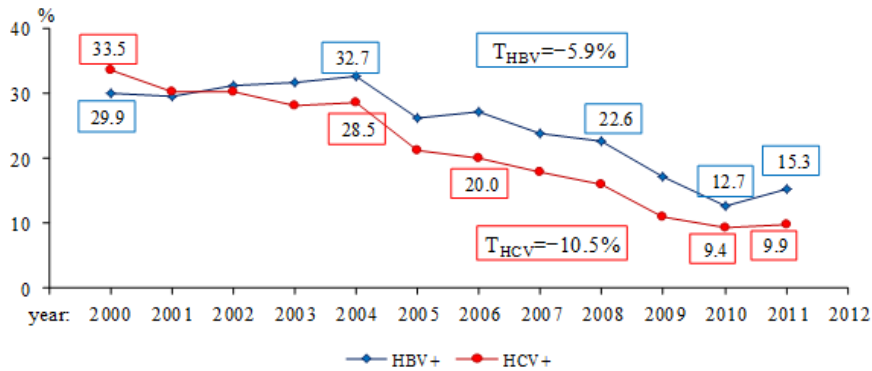
Data collection and analysis was achieved by compiling the data on Microsoft Excel computing program and BIOSTAT for Windows (Version 4.03 by Glantz).

## **Results**

Between 2000 and 2011 in the republic a growth of volumes of procured blood from 312.4 to 398.0 units was noted, in total equaled to 4,277.8 units. The proportion of blood wasted also increased from 8.3% to 8.7%.

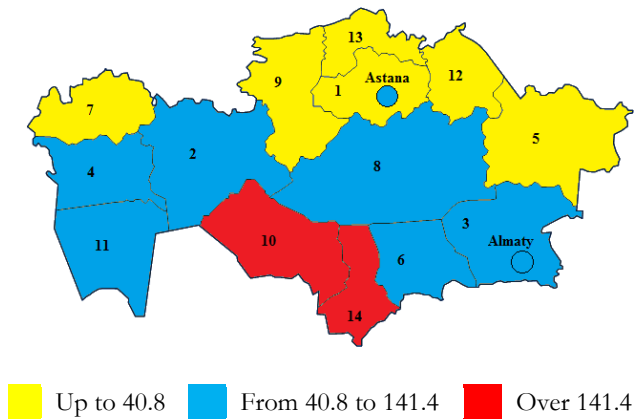
While the proportion of HBV and HCV among all blood discarded has decreased (Fig. 1). The average annual proportion of HBV was  $25.0 \pm 2.0$  (95% CI=21.0-29.0), of HCV  $21.3 \pm 2.6$  (95% CI=16.2-26.5).

According to the data of the Agency of Statistics the hepatitis are not differentiated according to types.



**Fig. 1:** The proportion of hepatitis B and C in the total number of blood wastes for 2000-2011/ HBV+, positive test for hepatitis B antigen, HCV+, reactive/positive antibody test for hepatitis C

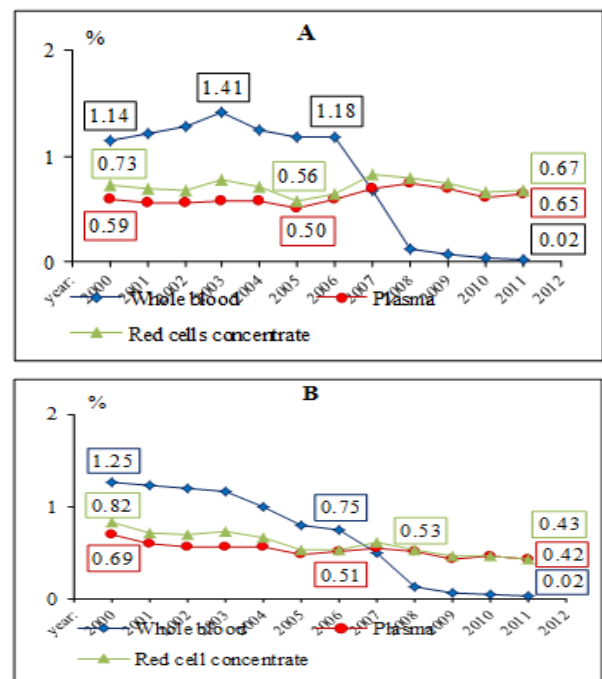
Therefore, we considered the incidence of all types of viral hepatitis per 100,000 populations in whole over the country for 2000-2011. A significant decrease from 185.6 to 16.2 was found. The regional features of the hepatitis distribution are shown in Table 1. The viral hepatitis incidences were grouped into three clusters (Fig. 2).



**Fig. 2:** The map of all viral hepatitis incidence per 100,000 population in Kazakhstan for 2000-2011. Regions: 1. Akmola, 2. Aktobe, 3. Almaty, 4. Atyrau, 5. East-Kazakhstan, 6. Zhambyl, 7. West-Kazakhstan, 8. Karaganda, 9. Kostanay, 10. Kyzylorda, 11. Mangistau, 12. Pavlodar, 13. North-Kazakhstan, 14. South-Kazakhstan

The total number of blood positive for TTI markers was 99,430 (5.2±0.4%) (95% CI=4.4-6.1). Among them the overall seroprevalence of HBV and HCV were 2.1±0.2% (95% CI=1.8-2.4) and 1.8±0.2% (95% CI=1.2-2.2) respectively.

The annual decline rates were -5.4% and -10.0%, respectively. Between 2000 and 2011 the HBV prevalence rate decreased from 2.5% to 1.3%, HCV prevalence rate also decreased from 2.8% to 0.9%. The proportion of HBV and HCV in whole blood, plasma and red cell concentrate are illustrated in Fig. 3. Decline/growth rates of HBV were -31.6% (whole blood), +0.8% (plasma) and -0.8% (red cell concentrate), for HCV -31.5%, -4.4% and -5.7%, respectively.



**Fig. 3:** The dynamics of hepatitis B (A) and hepatitis C (B) revealed in whole blood, plasma and red cell concentrate from 2000 to 2011

**Table 1:** The average annual incidence rate of viral hepatitis per 100,000 population in the Republic of Kazakhstan for 2000-2011 years

Region/ city	M±m	95% CI	T, %
Pavlodar	19.1±6.5	6.5-31.8	-23.5
West Kazakhstan	22.0±7.5	7.3-36.6	-22.7
North Kazakhstan	29.9±8.5	13.2-46.7	-24.3
Kostanay	32.5±7.2	18.4-46.7	-18.5
Akmola	34.0±7.5	19.4-48.6	-16.1
East Kazakhstan	37.1±6.8	23.7-50.4	-17.4
Aktobe	47.4±12.7	22.4-72.3	-23.4
Atyrau	49.5±21.4	7.6-91.3	-27.5
Astana city	56.8±11.2	34.8-78.7	-17.5
Karaganda	58.0±11.5	35.5-80.5	-16.2
Almaty region	59.1±11.9	35.9-82.4	-14.5
Almaty city	64.4±15.6	33.8-94.9	-20.3
Mangistau	77.0±36.4	5.7-148.2	-31.3
Zhambyl	104.2±21.5	62.1-146.3	-20.9
South Kazakhstan	179.7±30.8	119.3-240.0	-21.5
Kyzylorda	185.1±47.3	92.3-277.8	-21.5
Republic of Kazakhstan	74.5±14.3	46.4-102.6	-19.9

## Discussion

The objective of our study was to evaluate the prevalence of HBV and HCV in Kazakhstani blood donors. The average annual rate of HBV in this study was 2.1%, which is slightly lower when compared 2.58% found by Fessehaye et al. (25) in Eritrean donors, 4.7% in Pakistani donors and 15% in Egypt (26). However this index was higher than 0.20% found by Cheraghali in Iranian donors (27) and 1.1% found by Ejele et al.(28) in Niger delta region of Nigeria.

The average annual prevalence rate of HCV was equal to 1.8%, and this is high when compared to 0.57% in Eritrea (25), 0.2% in Kenya (29) and 0.06% in Iran (27). The prevalence was higher than values ranging between 0.072% and 0.6% reported from the USA and Albania (30, 31) but lower when compared to 2.7% in Egypt (32).

In blood transfusion centers a small portion of the whole blood is left, and the rest is processed in the blood components (red cells concentrate, plasma etc.). According to the reporting form N39 the presence of HBV and HCV are defined both in whole blood and in its components. Over the study period the HBV seroprevalence in whole

blood showed a considerable decreasing trend from 1.14% to 0.02%. In the red cell concentrate fraction the HBV slightly changed from 0.73% to 0.67%, whereas in plasma an increase from 0.59% to 0.65% was noted. The aligned HCV prevalence rates had steadily decreased in whole blood, red cell concentrate and plasma from 1.25% to 0.02%, from 0.82% to 0.43% and from 0.69% to 0.42%, respectively (Fig. 3). The reduction in the presence of hepatitis virus markers in whole blood and slight changes in plasma and red cell concentrate, are probably due to the fact that in recent years whole blood transfusion is reducing, blood component therapy is preferred and therefore most TTIs are revealed there.

Regionally the lowest incidence rates of viral hepatitis in Kazakhstan were found in Pavlodar (19.1±6.5; 95% CI=6.5-31.8) and West Kazakhstan (22.0±7.5; 95% CI=7.3-36.6) regions. The highest rates were found in the South Kazakhstan (179.7±30.8; 95% CI=119.3-240.0) and Kyzylorda (185.1±47.3; 95% CI=92.3-277.8) regions. The incidence of viral hepatitis in the regions with low and high levels were significantly different ( $P<0.05$ ). The objective causative-factor differences that effected the indicators, may possibly



relate to the accounting and registration questions, the preventive measures, the establishment of cause-effect relationship, and with other economic, medical-social, medical-geographical features in different regions of Kazakhstan.

The epidemiological assessment of hepatitis rate over 12 years in donor's blood showed a considerable reduction. However, the prevalence of TTIs among blood donors in Kazakhstan still has an important focus of attention. The reduction of the TTI markers can be achieved by truly reliable information about the health condition of both repeat and first time donors, involvement of preferably voluntary non-remunerated blood donors, comprehensive standardized screening of blood which are paramount for the organization of the most effective blood transfusion service (33, 34).

## Conclusion

The prevalence of hepatitis among donor's blood in Kazakhstan still remains a major concern for the blood transfusion service. The HBV prevalence is higher compared to HCV and this needs further investigation including studying the prevalence rate of HBV in the general population to address the issue. The decreasing prevalence rate of HCV among Kazakh donors is an encouraging signal, which indicates the effectiveness of the changes introduced in the National Blood Transfusion Service in line with the Ministry of Health and WHO strategy for blood safety.

## Ethical considerations

Ethical issues (Including plagiarism, Informed Consent, misconduct, data fabrication and/or falsification, double publication and/or submission, redundancy, etc) have been completely observed by the authors.

## Acknowledgments

We thank the Ministry of Public Health of the Republic of Kazakhstan and the Agency of Statistics of the Republic of Kazakhstan for providing

us essential data for the research. The authors declare that there is no conflict of interests.

## References

1. Nébié K, Ouattara S, Sanou M, Kientega Y, Dahourou H, et al. (2011). Poor procedures and quality control among nonaffiliate-d blood centers in Burkina Faso: an argument for expanding the reach of the national blood transfusion center. *Transfusion*, 51(7 Pt 2): 1613-8.
2. Messih IY, Ismail MA, Saad AA, Azer MR (2012). The degree of safety of family replacement donors versus voluntary non-remunerated donors in an Egyptian population: a comparative study. *Blood Transfus*, 20: 1-7.
3. Beeson PB (1943). Jaundice occurring one to four months after transfusion of blood or plasma. Report of seven cases. *JAMA*, 121(17): 1332-4.
4. Alam MM, Zaidi SZ, Malik SA, Shaukat S, Nacem A, et al. (2007). Molecular epidemiology of Hepatitis B virus genotypes in Pakistan. *BMC Infectious Dis*, 7: 115.
5. Gholami Parizad E, Khosravi A, Gholami Parizad E, Sadeghifard N, Ghafourian S (2012). Evaluation of Chronic Hepatitis B Infection in Patients with Seronegative HbsAg. *Iranian J Publ Health*, 41(2): 100-4.
6. Merat S, Rezvan H, Nouraié M, Jafari E, Abolghasemi H, et al. (2010). Seroprevalence of hepatitis C virus: the first population-based study from Iran. *Int J Infect Dis*, 14: 113-6.
7. Khan A, Tareen AM, Ikram A, Rahman H, Wadood A, et al. (2013). Prevalence of HCV among the young male blood donors of Quetta region of Balochistan, Pakistan. *Virology*, 10: 83.
8. Dodd RY (2007). Current risk for transfusion-transmitted infections. *Current Opinion in Hematology*, 14(6): 671-6.
9. Dayan S, Tekin A, Tekin R, Dal T, Hoşoğlu S, et al. (2013). HBsAg, anti-HCV, anti-HIV 1/2 and syphilis seroprevalence in healthy volunteer blood donors in southeastern Anatolia. *J Infect Dev Ctries*, 7(9): 665-9.
10. Kaur P, Basu S (2005). Transfusion-transmitted infections: existing and emerging pathogens. *J Postgrad Med*, 51(2): 146-51.

11. Ministry of Health, Kazakhstan (2009). *On approval of rules for donor medical examination before donating blood and blood components*. Nov 10, N680. Available from [http://online.zakon.kz/Document/?doc\\_id=30536265](http://online.zakon.kz/Document/?doc_id=30536265)
12. Editorial (2005): Blood supply and demand. *Lancet*, 365(9478): 2151.
13. Copeman J (2009). Introduction: Blood donation, bioeconomy, culture. *Body and Society*, 15: 1-28.
14. Enosolease ME, Imarengiaye CO, Awodu OA (2004). Donor blood procurement and utilisation at the University of Benin Teaching Hospital, Benin City. *Afr J Reprod Health*, 8(2): 59-63.
15. World Health Organization (2005). Global Database on Blood Safety, 2004-2005 report. Available from [http://www.who.int/bloodsafety/global\\_database/GDBSRReport2004-2005.pdf](http://www.who.int/bloodsafety/global_database/GDBSRReport2004-2005.pdf)
16. Panda M, Kar K (2008). HIV, hepatitis B and C infection status of the blood donors in a blood bank of a tertiary health care centre of Orissa. *Indian J Public Health*, 52(1): 43-4.
17. Matee MI, Magesa PM, Lyamuya EF (2006). Seroprevalence of human immunodeficiency virus, hepatitis B and C viruses and syphilis infections among blood donors at the Muhimbili National Hospital in Dar Es Salaam, Tanzania. *BMC Public Health*, 6:21.
18. van der Poel CL, Seifried E, Schaasberg WP (2002). Paying for blood donations: still a risk? *Vox Sanguinis*, 83(4): 285-93.
19. Official website of Agency of Statistics of the Republic of Kazakhstan. Available from [www.stat.kz](http://www.stat.kz)
20. Ministry of Health, Kazakhstan (2009). *On approval of the Nomenclature, the Rules of procurement, processing, storage, realization of blood and blood components*. Nov 6, N666. Available from [http://adilet.zan.kz/rus/docs/V090005925\\_](http://adilet.zan.kz/rus/docs/V090005925_)
21. <http://www.adilet.gov.kz/ru/node/846>
22. Glantz SA (1994). *Primer of biostatistics*. 4<sup>th</sup> ed. McGraw-Hill, New York, pp.: 30-195.
23. Igissinov SI (1974). Method of production and use of maps in oncological practice. *Kazakhstan Health*, 2: 69-71.
24. Bojarski AY (1977). *General Theory of Statistics*. Publishing House of Moscow University, Moscow, pp.: 125-160.
25. Fessehaye N, Naik D, Fessehaye T (2011). Transfusion transmitted infections – A retrospective analysis from the National Blood Transfusion Service in Eritrea. *Pan African Med J*, 9: 40.
26. Sievert W, Altraif I, Razavi HA, Abdo A, Ali Ahmed E, et al. (2011). A systematic review of hepatitis C virus epidemiology in Asia, Australia and Egypt. *Liver Int*, Suppl 2: 61-80.
27. Cheraghali AM (2012). Overview of Blood Transfusion System of Iran: 2002-2011. *Iranian J Publ Health*, 41(8): 89-93.
28. Ejele OA, Erhabor O, Nwauche CA (2005). The risk of transfusion-transmissible viral infections in the Niger-Delta area of Nigeria. *Sabel Medical Journal*, 8(1): 16-19.
29. Abdalla F, Mwanda OW, Rana F (2005). Comparing walk-in and call-responsive donors in a national and a private hospital in Nairobi. *East Afr Med J*, 82(10): 531-5.
30. Murphy EL, Fang J, Tu Y, Cable R, Hillyer C et al. (2010). Hepatitis C virus prevalence and clearance among US blood donors, 2006-2007: associations with birth cohort, multiple pregnancies, and body mass index. *J Infect Dis*, 202(4): 576-84.
31. Durro V, Koraqi A, Saliassi S (2010). Trends in the prevalence of transfusion-transmissible infections among blood donors in Albania. *Clin Lab*, 56(11-12): 591-5.
32. El-Gilany AH, El-Fedawy S (2006). Bloodborne infections among student voluntary blood donors in Mansoura University, Egypt. *East Mediterr Health J*, 12(6): 742-8.
33. Epstein JS (2010). Alternative strategies in assuring blood safety: An overview. *Biologicals*, 38(1): 31-5.
34. Smit Sibinga CTh, Pitman JP (2011). Transmission of HIV Through Blood – How To Bridge the Knowledge Gap. In: *HIV and AIDS - Updates on Biology, Immunology, Epidemiology and Treatment Strategies*. Eds, Dumais N. InTech, Croatia, pp.: 583-618.