

Seroprevalence of Viral Hepatitis B and C among Blood Donors at the Agadir Regional Transfusion Center

Mbarek Azouaoui^{1*}, Mehdi Zouaoui¹, Mohamed Mazghi¹, Nourdine Aqodad¹, Laila Lahlou², Abdelatif Aamoum³, Lhabib Nmili³

¹Service of Gastroenterology, University Hospital of Agadir, Agadir, Morocco

²Department of Epidemiology and Biostatistics, University Hospital of Agadir, Agadir, Morocco

³Agadir Regional Transfusion Center, Agadir, Morocco

Email: *m.azouaoui@gmail.com

How to cite this paper: Azouaoui, M., Zouaoui, M., Mazghi, M., Aqodad, N., Lahlou, L., Aamoum, A. and Nmili, L. (2023) Seroprevalence of Viral Hepatitis B and C among Blood Donors at the Agadir Regional Transfusion Center. *Open Journal of Gastroenterology*, 13, 393-400.

<https://doi.org/10.4236/ojgas.2023.1311037>

Received: August 8, 2023

Accepted: November 27, 2023

Published: November 30, 2023

Copyright © 2023 by author(s) and Scientific Research Publishing Inc. This work is licensed under the Creative Commons Attribution International License (CC BY 4.0).

<http://creativecommons.org/licenses/by/4.0/>



Open Access

Abstract

Introduction: The prevention of transmission of infections transmitted by blood transfusion depends on the correct selection of donors and the performance of adequate serological tests for the detection of pathogens, in particular viral hepatitis B and C viruses. The main objective of our study was to evaluate the seroprevalences of viral markers B and C in blood donors in the Agadir region. The secondary objectives were to evaluate these prevalences according to the socio-demographic characteristics of the donors and to evaluate the seroprevalence of other markers, in particular the human immunodeficiency virus. **Methods:** A retrospective analysis of files from the blood donor registers of the Agadir regional transfusion center, covering the period from 1 January to 31 December 2020, was conducted. **Results:** The study included 13,092 donors, the mean age was 34 ± 11 , the M/F sex ratio was 2.6. The overall seroprevalences of HBsAg, anti-HCV, anti-HIV were respectively: 1.3%, 0.2% and 0.3% respectively. For HBsAg, the prevalence was higher in men ($p = 0.007$). The prevalence of anti-HCV was higher in rural areas than in urban areas ($p < 0.001$), and differed between the different provinces of the region ($p = 0.001$). **Conclusion:** The low prevalences of viral markers B and C in our study compared to those recorded in the general Moroccan population reflect the effectiveness of preventive measures with regard to donor selection.

Keywords

Prevalence, Blood Donors, HBV, HCV, Agadir-Morocco

1. Introduction

Hepatitis B virus (HBV) and hepatitis C virus (HCV) are a global public health

problem worldwide and particularly for blood recipients [1] [2] [3].

In Morocco, these viruses are the main cause of chronic liver disease, hepatocellular insufficiency and hepatocellular carcinoma [4]. Safety in blood transfusion has made great progress with regard to infectious and immunological risk. According to Moroccan blood transfusion legislation, the screening for HBV and HCV, are part of the obligatory tests for blood donation.

Epidemiological surveillance of these infections in blood donors makes it possible to monitor the prevalence and identify the main means of preventing their dissemination through transfusion [5]. To our knowledge, no seroprevalence study of viral hepatitis has been carried out among blood donors at the Agadir regional transfusion center (ARTC) to date. The aim of our study was first of all to evaluate the seroprevalences of viral markers B and C among blood donors in the region of Agadir (Souss-Mass) and, secondly, to compare these prevalences with those of other regions and to assess local epidemiology, to evaluate these prevalences according to the sociodemographic characteristics of these donors and finally to evaluate the seroprevalence of other infectious markers in these donors including human immunodeficiency virus (HIV) and syphilis.

2. Materials and Methods

This is a retrospective study based on data collected from the blood donation registers of the ARTC (Souss-Massa region) and carried out over a period of one year from January 1, 2020 to December 31, 2020. It should be noted that the Agadir region includes six provinces: Agadir, Inezgane, Taroudant, Tiznit, Bio-ugra and Tata. All the data collected came from non-computerized registers.

A pre-donation medical examination was always done to select subjects at risk. The exclusion criteria appearing are: age ≤ 18 and ≥ 65 years old, patient infected with one of these agents (HIV, HBV, HCV, syphilis), history of jaundice, recent fever, chronic disease, anemia, weight less than 50 kg, risky behavior (male homosexuality and intravenous drugs), pregnant or breastfeeding woman and patient who has donated blood in the last six months.

Blood samples collected were tested at the ARTC laboratory for viral markers using commercial tests according to a standardized procedure. Biological screening used 4th generation Enzyme Linked Immuno-Sorbent Assay (ELISA) type serological methods. The search for surface hepatitis B virus (HBsAg) antigen is carried out using the MonolisaTM HBs Ag ULTRA test (Bio-rad, France), and for the serodiagnosis of viral hepatitis C, the detection of capsid antigen and anti-HCV antibodies was carried out using MonolisaTM HCV Ag-Ab (Bio-rad, France). The detection of HIV markers was carried out by the Genscreen TM ULTRA HIV Ag -Ab test (Bio-rad, France), the search for syphilis was carried out by the Treponema Pallidum Hemagglutination Assay (TPHA) technique.

Demographic and socio-professional data (age, sex, place of residence, urban or rural area, profession, type of collection (fixed or mobile), serological data (HBs Ag, anti-HCV, anti-HIV-1/2, syphilis) were recorded.

Data analysis was performed using Jamovi software version 1.8 (<https://www.jamovi.org>). The average, standard deviation, the effective and the percentage were used for the description of the variables, the student's t test for independent samples was used to compare the independent groups with quantitative variables, and the Chi-square test or Fisher's exact test were used to compare the groups with qualitative variables. The threshold $p < 0.05$ was retained as statistically significant in our study.

3. Results

Of the 13,113 blood donors, only 13,092 files were usable from the ARTC registers. The data on the profession of the donors were missing on the exploited registers as well as type of collection and the results of serology of syphilis. The average age of the study population was 34 ± 11 years with a predominance of the male sex (72.5%) as well as urban origin (81%) (**Table 1**).

Of the 13,092 blood donors, 248 (1.89%) had at least one infection transmissible by blood transfusion. The overall seroprevalences were 1.3% for HBsAg, 0.2% for anti-HCV Abs and 0.3% for HIV (**Table 2**).

Table 3 summarizes the seroprevalence of HBV in donors according to their socio-demographic characteristics and shows from this table that the seroprevalence of HBV is higher in men than in women ($p = 0.007$). **Table 4** shows the seroprevalence of HCV among blood donors according to their sociodemographic characteristics and emerges from this table that there is a statistically significant difference in the seroprevalence of HCV between the different provinces of the Agadir region ($p = 0.001$) with a higher seroprevalence in the province of Taroudant (0.5%) and Inezgane (0.45%). HCV seroprevalence is also

Table 1. Sociodemographic characteristics of blood donors in our study (n = 13092)

Variables	Description
Age (year)	34.6 ± 11.8
Sex n (%)	
Male	94,476 (72.5)
Female	3600 (27.5)
Province n (%)	
Agadir	8860 (67.6)
Biougra	499 (3.5)
Taroudant	987 (7.5)
Inezgane	1091 (8.3)
Tata	338 (2.5)
Tiznit	1092 (8.3)
Urban/Rural n (%)	
Urban	10,602 (81)
Rural	2485 (19)

Table 2. Viral seroprevalence among blood donors at the Agadir regional transfusion center (n = 13,092).

Tests	Number of cases	Prevalence (%)
HBV ^a	178	1.3
HCV ^b	28	0.2
HIV ^c	42	0.3
HBV-HCV	0	0
HBV-HIV	1	0.0007
HCV-HIV	2	0.01

^aHepatitis B virus, ^bHepatitis C virus, ^cHuman immunodeficiency virus.

Table 3. HBV seroprevalence among blood donors at the Agadir regional transfusion center according to their sociodemographic characteristics

	HBV ^a positive	HBV ^a negative	P-value
Sex n (%)			
Female	65 (0.49)	3535 (27.03)	0.007
Male	113 (0.86)	9363 (71.6)	
Province n (%)			
Tata	1 (0.29)	337 (99.7)	0.063
Tiznit	23 (2.1)	1069 (97.8)	
Taroudant	14 (1.4)	973 (98.5)	
Agadir	110 (1.24)	8750 (98.75)	
Biogra	11 (2.2)	488 (97.77)	
Inezgane	11 (1.008)	1080 (98.99)	
Age (year)	35.3 ± 11.2	34.6 ± 11.8	0.435
Urban/Rural n (%)			
Urban	148 (1.39)	10453(98.6)	0.464
Rural	30 (1.2)	2455 (98.7)	

^aHepatitis B virus.

Table 4. HCV seroprevalence among blood donors at the Agadir regional transfusion center according to their sociodemographic characteristics.

	HCV positive	HCV negative	P-value
Sex n (%)			
Female	6 (0.04)	3594 (27.4)	0.469
Male	22 (0.1)	9454 (72.2)	
Province n (%)			
Tata	0 (0)	338 (100)	0.001

Continued

Tiznit	1 (0.09)	1091 (99.9)	
Taroudant	5 (0.5)	981 (99.4)	
Agadir	16 (0.17)	9064 (99.82)	
Biogra	1 (0.2)	498 (99.7)	
Inezgane	5 (0.45)	1086 (99.54)	
Age (year)	34.5 ± 12.3	34.6 ± 11.8	0.949
Urban/Rural n (%)			
Urban	15 (0.14)	10,586 (99.8)	
Rural	13 (0.52)	2472 (99.4)	<0.001

^aHepatitis C virus

higher in rural areas compared to urban areas ($p < 0.001$). The mean age of HIV-positive donors is higher than that of HIV-negative subjects ($p = 0.003$).

4. Discussion

The ARTC takes care of the availability of blood by collecting products in the 6 provinces of the Agadir region, ensuring donor loyalty and providing the better transfusion safety. The anamnesis and the pre-donation physical examination make it possible to find proven risk factors (risk behaviour, clinical symptoms) and this excludes the subjects concerned from donation [6].

HBV infection is a global health problem with the highest prevalence in Asia and sub-Saharan Africa. The overall seroprevalence of HBV in our study was 1.3% and is lower than that found in the general Moroccan population, which is 2% [7], this is explained by the selection of donors made by the pre-donation medical examination. This prevalence is identical to that found in the Dakhla region (southern Morocco) [8], and lower than that found in donors from the military hospital in Rabat (Morocco) [9], and higher than that found in donors from the military hospital in Marrakech [10]. Compared to the Maghreb countries, we note that the prevalence of HBV in the donors of our study is much lower, particularly in comparison with that of Tunisia [11]. Similarly, the prevalence in our study is lower than that of countries in sub-Saharan Africa with a high prevalence, with the exception of the Kamina region (Congo), which has a prevalence similar to that of our study [12] [13] [14] (Table 5). This rate of HBV in our donors is higher than that found in France (0.005%) in relation to the low endemicity of HBV in the general French population. Our study also shows a significant increase in the prevalence of HBV in male donors compared to female donors, probably because of higher risk behaviors in men compared to women, which would require better awareness and information in male population, particularly on the modes of transmission of this virus.

The prevalence of HCV obtained in our study was 0.2% and it's low compared to that of the general Moroccan population (which is 1.2%) [7], probably also

Table 5. Comparison of the seroprevalences of viral markers in blood donors in the Agadir region with those in other regions and other countries (in %).

Authors	Country	HBV ^a	HCV ^b	HIV ^c
F. Babokh	Morocco (Marrakesh)	0.07	0.01	0
H. Khalouki	Morocco (Dakhla)	1.4	0	0
J. Uwingabiye	Morocco (Rabat)	3.97	2.45	0.15
I. Lahlou Amine	Morocco (Meknes)	-	0.33	-
Safer	Tunisia	10	1.8	-
F. Ankouane	cameroon	12.6	3.2	3.3
R.Dray	Djibouti	10.4	0.3	1.9
Jm. Kabinda	congo	4.2	3.8	-
M. Kabamba	Congo (Kamina)	1.6	0.2	2.9
J. Pillonel	France	0.005	0.003	-
Our study	Morocco (Agadir)	1.3	0.2	0.3

^aHepatitis B virus, ^bHepatitis C virus, ^cHuman immunodeficiency virus.

explained by the careful selection of donors. This rate remains higher than that of the military hospital in Marrakech (Morocco) (0.01%) [10] and that of the Dakhla region (Morocco) (0%) [8] and that observed in France (0.003%) [5] explained by the low prevalence of HCV in the general French population (0.30%, Association Française pour l'études du Foie 2017). Besides, this prevalence among our donors is less than 2.45% found among blood donors from Rabat [9], 1.8% found among donors in Tunisia [11] and 3.2% obtained among blood donors from Congo [14]. on the other hand, this prevalence is similar to that obtained in Meknes (Morocco) [15] and that observed in Djibouti [13] and that of Kamina (Congo) [16] (Table 5). In our study, there was a significant increase in HCV among donors from rural areas compared to urban areas, which would require a strengthening of the awareness of this rural population on the modes of transmission of HCV especially by blood, probably ignored by this population. Compared to the distribution of HCV among our donors according to the provinces of the Agadir region, there is a significant increase in HCV among donors from Taroudant (0.5%) and Inezgane (0.45%).

The association between HIV, HBV and HCV can be explained by their modes of transmission and the risk factors common to these infections. Co-infection proved to be rare in our study, it concerns only one case of HBV-HIV and two cases of HCV-HIV.

5. Conclusion

The seroprevalences of HBV and HCV among ARTC blood donors are lower than that of the general Moroccan population. Thanks to the improvement of donor selection over time, to the progress made in the biological qualification of

donations, blood products in the Agadir region present a low risk of infection with HBV and even less with HCV. However, to guarantee a higher viral safety of blood donations, other measures must be put in place, in particular, the systematic search for HBV DNA and HCV RNA in all blood donors, as well as the strengthening of preventive measures in the general population.

Conflicts of Interest

The authors declare no conflicts of interest regarding the publication of this paper.

References

- [1] WHO (2004) Global Database on Blood Safty. Report: 2000-2001. WHO, Geneva, 29 p.
- [2] Andoulo, F., Tagni-Sartre, M., Noah, D., Djapa, R. and Ndam, E. (2013) Prevalence of the Hepatitis B Surface Antigen in a Population of Workers in Cameroon. *Open Journal of Gastroenterology*, **3**, 323-327. <https://doi.org/10.4236/ojgas.2013.38057>
- [3] Nlombi, C.M., Longo-Mbenza, B., Nsukini, S.M., Tamfum, J.J.M., Nanituma, H.S. and Ngoma, D.V. (2001) Prevalence of HIV and HBsAg in Blood Donors. Residual Risk of Transmission for Blood Recipients in East-Kinshasa, Democratic Republic of Congo. *Médecine Tropicale*, **61**, 139-142.
- [4] Benazzouz, M.U. (2009) Carcinome hépatocellulaire sur cirrhose post-virale B et C au Maroc. *Revue Francophone Des Laboratoires*, **2009**, 31-32. [https://doi.org/10.1016/S1773-035X\(09\)70276-X](https://doi.org/10.1016/S1773-035X(09)70276-X)
- [5] Pillonel, J., Boizeau, L., Gallian, P., *et al.* (2020) Epidémiologie des donneurs de sang infectés par le VHB et le VHC et risque résiduel de transmission de ces infections par transfusion en France, 1992-2018. *Bulletin Epidémiologique Hebdomadaire*, 632-639.
- [6] de Almeida Neto, C., Murphy, E.L., McFarland, W., Junior, A.M., Chen, S., Chamone, D.A. and Sabino, E.C. (2009) Profile of Blood Donors with Serologic Tests Reactive for the Presence of Syphilis in São Paulo. *Brazil Transfusion*, **49**, 330-336. <https://doi.org/10.1111/j.1537-2995.2008.01977.x>
- [7] (n.d.) Plan stratégique national de lutte contre les hépatites virales 2022-2026. Ministère de la santé et de la protection sociale, Maroc.
- [8] Khalouki, H., Zouhair, S., Elkamouni, Y. and Arsalane, L. (2020) Séroprévalence de l'hépatite virale B dans la région Dakhla. Thèse de Doctorat, Faculté de Médecine et de Pharmacie de Marrakech, Marrakech.
- [9] Uwingabiye, J.E., Zahid, H., Unyendje, L. and Hadeif, R. (2016) Séroprévalence des marqueurs viraux sur les dons du sang au centre de transfusion sanguine, hôpital militaire d'instruction mohammed V de Rabat. *Pan African Medical Journal*, **25**, Article No. 185. <https://doi.org/10.11604/pamj.2016.25.185.6266>
- [10] Babokh, F., Rahali, F.Z., Eddyb, S., *et al.* (2021) Séroprévalence des hépatites virales Bet C, VIH et de la syphilis chez les donneurs du sang au centre de transfusion sanguine de l'hôpital militaire Avicenne de Mararkech. *PAMJ*, **5**, Article No. 38. <https://doi.org/10.11604/pamj-cm.2021.5.38.25169>
- [11] Zou, S., Stramer, S.L. and Dodd, R.Y. (2012) Donor Testing and Risk: Current Prevalence, Incidence, and Residual Risk of Transfusion—Transmissible Agents in US Allogeneic Donations. *Transfusion Medicine Reviews*, **26**, 119-128. <https://doi.org/10.1016/j.tmr.2011.07.007>

- [12] Ankouane, F., Noah Noah, D., Atangana, M.M., et al. (2015) Séroprévalence des virus des hépatites B et C, du VIH-1/2 et de la syphilis chez les donneurs de sang de l'hôpital de Yaoundi, région du centre, Cameroun. *Transfusion Clinique et Biologique*, **23**, 72-77. <https://doi.org/10.1016/j.tracli.2015.11.008>
- [13] Dray, X., Dray-Spira, R., Bronstein, J. and Mattera, D. (2005) Séroprévalence des virus de l'immunodéficience humaine et des hépatites B et C parmi les donneurs de sang en république de Djibouti. *Médecine Tropicale*, **65**, 39-42.
- [14] Kabinda, J.M., Miyanga, S.A., Misingi, P. and Ramazani, S.Y. (2014) Les hépatites B et C chez les donneurs bénévoles de sang et non rémunérés de l'Est de la République démocratique du Congo. *Transfusion Clinique et Biologique*, **21**, 111-115. <https://doi.org/10.1016/j.tracli.2014.04.001>
- [15] Lahlou Amine, I., Zouhair, S., Chegri, M. and L'kassmi, H. (2010) Séroprévalence des anticorps anti-VHC chez les patients de l'hôpital militaire Moulay Ismail (Meknès, Maroc): Analyse des données du laboratoire de biologie médicale (2002-2005). *Bulletin de la Société de pathologie exotique*, **103**, 255-258. <https://doi.org/10.1007/s13149-010-0064-x>
- [16] Kabamba Nzaji, M. and Ilunga, B.K. (2013) Prévalence des marqueurs infectieux chez les donneurs de sang en milieu rural. Cas de l'hôpital général de référence de Kamina. *Santé Publique*, **25**, 213-217. <https://doi.org/10.3917/spub.132.0213>