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# PREVALENCE OF CYTOMEGALOVIRUS ANTIBODIES IN BLOOD DONORS IN ZIGUINCHOR

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**ABSTRACT**

***Introduction*:** The human cytomegalovirus (CMV) is a virus belonging to the herpes virus family. It causes latent and persistent infections and may be responsible for morbidity and mortality in immunocompromised and newborn infants. The objective of this study is to determine its prevalence among our blood donors. ***Patients and methods*:** Prospective cross-sectional study conducted from November 2019 to February 2020. All donors were screened for CMV and other routine tests (HIV, hepatitis B and C, syphilis). The fisher test was used to analyse the data and we considered a threshold $p < 0.05$ to be significant. ***Results:*** Out of a total number of 121 donors, 89.3% (n=108) are male and 10.7% (n=13) are female (sex ratio= 8.3). The average age of the donors was 32.57 years (extremes of 18 to 57 years). Older donors represented 45.5% (n=55) versus 54.5% (n=66) of new donors. The prevalence of CMV was 43.8% (n=53), HIV prevalence was 0.8% (n=1, HIV profile 1), and hepatitis B prevalence was 11.6% (n=14). For hepatitis C and syphilis no donors were tested positive. There was no significant difference between CMV seroprevalence and sex (p=0.314) or status (p=0.09).



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# INTRODUCTION

Blood transfusion is not an innocuous act and requires a set of practical measures, including the biological qualification of blood donations, in order to preserve the safety of the recipients of blood products (Assal, 2007). In our country, mandatory testing for biological qualification includes the systematic screening for HIV, Syphilis, Hepatitis B and Hepatitis C (Senegal Politique NationaleTransfusion Sanguine 2006). Testing for cytomegalovirus is not carried out routinely. This virus, although asymptomatic, is responsible for frequent, ubiquitous infections and can be transmitted by blood transfusion (Adjei *et al.*, 2008).

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In immunocompromised individuals (HIV-infected, tuberculosis patients, cancer patients, pregnant women and newborns), this virus can cause serious and life-threatening infections (Essomba *et al.*, 2015). Studies have shown a fairly high prevalence of this virus among blood donors and the general population. For example, Essomba.N and al (4) found during their work on blood donors in Cameroon, a seroprevalence of 98.8% in 2014. Antonia D and al found a seroprevalence of 41.9% in France in 2010 (Antona, 2010) while in South America, Alvarado. E and al found a seroprevalence of 80% in pregnant women in 2014 (6). For these reasons, developed countries have started to reduce the risk of CMV infection in immunocompromised people by screening leukocyte reduction (Essomba, 2015). In our region, no study has yet been conducted on the seroprevalence of CMV in blood donors. We have offered to conduct a study on this issue.

# PATIENTS AND METHODS

We conducted a cross-sectional prospective study from November 2019 to February 2020 in the blood bank of the Ziguinchor Peace Hospital. After declaration of suitability by medical consultation, all donors received during this period were included in the study. A total of 121 donors were included in the study, 108 of whom were male and 13 female, and were between the ages of 18 and 57. We performed the routine mandatory testing for the biological qualification of blood donors. We added CMV (IgG and IgM) tests. The 5 ml blood samples were collected on EDTA tubes and after centrifugation the plasma was used as working material.

**For the detection of cytomegalovirus (CMV):** A so-called rapid test based on the principle of immunochromatogaphy developed by OnSiteTM laboratories was used for all plasma samples. This test detects both anti-IgG and anti-IgM antibodies to CMV. The test has a sensitivity of 99.4% and specificity of 99.6%.

**For HIV testing:** A test called determineAbott$^{TM}$ is used as a first-line test. For positive tests, a second confirmatory test called SD biolineAbott is used and then a third typing test called Multisure$^{TM}$ is used. This diagnostic algorithm is validated by the National AIDS and STI (Sexually Transmitted Infections) Control Council in our country. These tests are 99.4% sensitivity and 99.6% specificity.

**For the screening of hepatitis B and C viruses:** The search for HBsAg and antibodies to HVC is carried out by the immuno-chromatographic method of the ABON$^{TM}$ laboratory reagents. These tests have a sensitivity of 99.4% and a specificity of 99.6%.

**For the detection of syphilis:** The rapid RPR (rapid plasma reagin) test is used and consists of an eight-minute agglutination reaction of serum with charcoal containing cardiolipins under circular agitation. If antibodies are present in the serum, the test is positive. If we had positive cases, the TPHA$^{TM}$ (Treponema pallidum hemaglutination assay) would be performed for confirmation of syphilis.

**Analysis of the data:** We used Epi info software for all statistical analysis. The Fisher's test was used for the calculation and we considered $p < 0.05$ to be a significant threshold.

# RESULTS

**Characteristics of blood donors:** We included 121 donors in our study. 89.3% (n=108) are male and 10.7 %( n=13) are female (sex-ratio= 8.3). The average age of the donors was 32.57 years (extremes of 18 to 57 years). Older donors accounted for 45.5 %(n=55) versus 54.5%( n=66) new donors.

**Biological parameters:** The prevalence of CMV was 43.8%(n=53), HIV prevalence was 0.8%(n=1, HIV profile 1), hepatitis B prevalence was 11.6%(n=14), and for hepatitis C and syphilis no donors tested positive. There was no significant difference between CMV seroprevalence and sex (p=0.314) or status (p=0.09). All CMV positive donors were positive for IgG antibodies only.

**Table 1. Distribution of donors by sex and prevalence of infectious markers**

| | HBS Ag | IV | VC | SYPHILIS | CMV |
|---|---|---|---|---|---|
| Male : | 13 | 1 | 0 | 0 | 46 |
| Female: | 1 | 0 | 0 | 0 | 7 |
| TOTAL | 14 | 1 | 0 | 0 | 53 |
| P | 0.538 | | | | 0.314 |

**Table 2. Distribution of donors by infectious marker status and prevalence**

| | HBS Ag | HIV | HVC | SYPHILIS | CMV |
|---|---|---|---|---|---|
| Former donor: | 3 | 0 | 0 | 0 | 20 |
| New donor: | 11 | 1 | 0 | 0 | 33 |
| TOTAL | 14 | 1 | 0 | 0 | 53 |
| P | 0.04 | 0.545 | | | 0.09 |

**Table 3. Distribution of Donors by CMV Seroprevalence and Hepatitis B Seroprevalence (HBS Ag) and HIV Seroprevalence**

| | | HIV | | | HBSAg | |
|---|---|---|---|---|---|---|
| | Négative | | Positive | Négative | | Positive |
| CMV Négative: | 68 | | 0 | 58 | | 10 |
| CMV Positive: | 52 | | 1 | 49 | | 4 |
| p | | 0.438 | | | 0.175 | |

# DISCUSSION

In our region, this was the first seroprevalence study to be conducted. It's objective was to find out the seroprevalence rate among our old and new donors. What led us to conduct this study was to justify the need to abandon the delivery of whole blood, filtered and leukocyte-depleted blood to immunocompromised subjects in our region. This work looked at a total number of 121 donors of which 89.3% (n=108) are male and 10.7% (n=13) are female (sex-ratio= 8.3). The average age of the donors was 32.57 years with extremes of 18 to 57 years. These results are similar to those of Essomba. and al. (2015) who, in a study in Cameroon in 2014 on the same subject, found a sex ratio of 5.18 and an average age of 31.1 years (extremes of 19 to 56 years). The male predominance in African blood banks can be explained by a number of factors in our context such as women's menstruation or maternity wards or the solicitation of men compared to women (Tagny *et al.,* 2009). Older blood donors accounted for 45.5% (n=55) versus 54.5% (n=66) of new donors. In most studies conducted in Africa, the number of new donors exceeded the number of old donors (Kabinda, 2014; Tonda, 2017). This may be due to the lack of effective donor retention policies (Tagny, 2009). In this study, the seroprevalence of routine infectious markers gave the following results: HIV seroprevalence of 0.8% (n=1, HIV profile 1), hepatitis B seroprevalence of 11.6% (n=14). For hepatitis C and syphilis no donors tested positive. The low HIV seroprevalence could be explained by the implementation of a national policy in our country based on the objectives of the three 90s of the World Health Organization (WHO)(11). As regards the prevalence of HBSAg, our results are fairly close to those of Essomba. N and al (Essomba *et al.,* 2015) who found a prevalence of 11.9% in 2014 in Cameroon. The negativity of syphilis and hepatitis C tests among our donors during the period does not exclude their prevalence in our country. Indeed, during a study conducted at the national blood transfusion centre (CNTS) in Senegal, Dièye T. N and al (Dieye *et al.,* 2006) found a seroprevalence of 1.4% for hepatitis C in 2006.

We did not find a published study for our region. For syphilis, a study conducted at the CNTS in Senegal in 2015 by Seck. M and al (Seck *et al.,* 2016) showed a seroprevalence of 0.34% in authorized donors. Similarly, a study conducted in Gabon in 2017 by Tonda J and al (Tonda, 2017) found a seroprevalence of 4.9% and 1.6% respectively for hepatitis C and syphilis. The purpose of the study was to determine the seroprevalence of cytomegalovirus (CMV) in our blood donors. We found a seroprevalence of 43.8% (n=53) out of a total of 121 donors. The result obtained is very minimal compared to the Essomba. N andal (4) study who found a seroprevalence of 98.8% out of a total number of 167 donors. Other studies conducted on the same subject have found a fairly high prevalence of CMV. For example, in 2013, Agbodeka K and al (Agbodeka**,** 2013) found a seroprevalence of 96.7% among 182 blood donors in Togo. Another study conducted by Saidj.O and al (Saidj, 2015) in 2014 in Algeria found a prevalence of 79.5% among a total of 120 donors. Our study found no significant difference between CMV seroprevalence and the sex (p=0.314) or status (p=0.09) of the donor. Similarly, there was no significant difference between donors infected with HIV and CMV or those infected with hepatitis B (HBSAg) and CMV and those uninfected (see Tables II and III). This could be explained by the fact that the virus is endemic to the general population from maternity, birth or childhood (Adjei, 2008; Antona, 2010; Alvarado-Esquivel, 2014; Leruez-Ville, 2020). However, it showed a significant difference in the prevalence of hepatitis B according to donor status ( p=0.04). Upon close analysis of the data, we noted a positive hepatitis B status in 3 former donors. We noticed a negativity of this test in their previous donations. This could be explained by an infection when the seroconversion period was not reached at the time of analysis. Indeed, a study conducted in Senegal by Touré A.O and al (Touré-Fall, 2009) between 2003 and 2005 showed a positive hepatitis B test in 23 former donors observed over a period of 3 years.

## CONCLUSION

Despite continuous efforts to improve the quality of blood transfusion in our country, problems of transfusion safety persist. This study conducted to determine the prevalence of cytomegalovirus (CMV) in our blood donors, leads us to recommend leukodepletion of whole blood or blood pellets for the preservation of the health of immunocompromised persons transfused in our region.

**Limit**: In a context of limited means (CMV reagent costs), we were unable to quantify the levels of anti-IgG antibodies in our blood donors and used the Lorentz formula to calculate the minimum sample size. We were not able to do this study on a larger number of donors.

**Conflicts of Interest:** The authors declare that they have no conflict of interest with this article.

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