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Review Article

Management of the SARS-CoV-2 pandemic (COVID-19) by the Moroccan National Blood Center: Reactivity, Adaptability and Governance

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Abstract

At the end of 2019, a new coronavirus (SARS-CoV-2) was identified in people living in the city of Wuhan in China. The first people identified as infected went to the city's seafood market, where live animals were also sold. Since the appearance of the first cases in Wuhan, the epidemic has spread to the international scale with actually at 18 May 4.679.511 cases and 315.005 deaths worldwide. The pandemic is considered by international scientific societies to have an impact on blood donation and transfusion activities at the level of transfusion establishments on an international scale. Efforts must, therefore, be made at the level of the transfusion centers to ensure proper management of this health crisis at SARS-CoV-2.

The National Blood Center of Morocco has demonstrated a great reactivity and a great adaptability since the beginning of the epidemic according to the evolution of scientific data to ensure the availability and safety of blood products to patients.

INTRODUCTION

The National Blood Center of Morocco(MNBC) constitutes a scientific reference on a national scale. He is responsible for the implementation of the Ministry of Health's policy on blood transfusion [1]. He is responsible for carrying out several missions, including scientific and epidemiological monitoring and technical support for Moroccan Regional Blood Centers (MRBC) [1]. In this context, since the outbreak of the new coronavirus SARS-CoV-2 on 31 December 2019 in China, the MNBC organized several brainstorming meetings in the presence of national experts in blood transfusion in order to provide information about the real risk of this virus (in blood donors and in transfused patients), and about the impact of the epidemic on the continuity of the various activities at the level of the blood transfusion establishments and essentially on the national stock of labile blood products(LBP). So, several recommendations have been issued as the national and international epidemiological situation has changed. These recommendations have been updated taking into account the updating of data from national health authorities and international scientific societies related to this health crisis.

The MNBC recommendations mainly concerned the following aspects:

- The safety of blood products and these components;
- Strengthening of donor and recipient haemovigilance systems;
- Adaptation and reorganization of the work flow for the smooth running of activities while protecting donors and the health actors involved in these activities;
- Maintaining transfusion activity and blood donation;
- Internal and external communication;
- Therapeutic management of COVID-19 infected patients;

THE CHALLENGES OF BLOOD TRANSFUSION DURING THE COVID-19 PANDEMIC

The current SARS-CoV-2 pandemic is considered to have the potential to decrease and jeopardize the supply of blood products. Thus, blood transfusion services must be ready to adapt quickly, in response to changing circumstances and when the supply of blood products is likely to be affected. Indeed, collection restriction measures are likely to disrupt supplies and generate a shortage of blood products which is extremely detrimental in terms of patient care, and the quality and safety of care. Maintaining blood collections is therefore essential to ensure national self-sufficiency in blood products [2,5].

For the risk of transmission of SARS-CoV-2 through blood and

its components, it is not well documented but it is likely to be a minimal theoretical risk [2-5]. The transfusion centers must then ensure availability and strengthen the safety of blood products during this period.

THE MNBC RECOMMENDATIONS TO ENSURE THE SAFETY OF BLOOD PRODUCTS AND THESE COMPONENTS

Although the risk of transmission of the SARS-CoV-2 virus was considered theoretical, as a precaution, the MNBC has taken measures to reduce the risk of transmission of SARS-CoV-2 by blood products.

The exclusion of at-risk donors

Donor selection is an essential element of blood safety [2,4,5]. Thus, since the outbreak of the new coronavirus epidemic in China in 2019, the MNBC and like other countries has closely monitored all the scientific data published by the Chinese teams and in particular the recommendations of international authorities concerning of the real risk of the virus for donors and for transfused patients [7-9].

The European Center of Disease Control (ECDC), on 22 January 2020, recalls that the potential risk of transmission of the SARS-CoV-2 virus by products of human origin remains unknown [8]. Regarding blood donations, the ECDC recommended on January 31, 2020, the following measures:

1) a deferral of 21 days for candidates to the donation who have been in contact with a confirmed case or a return from China [8].

2) a deferral of 28 days after the end of symptoms and the end of treatment for donation candidates who have been infected with the SARS-CoV-2 virus to take into account the current uncertainty concerning a possible viral persistence in the blood and in biological fluids [8].

The American Association of Blood Banks (AABB), Transfusion Transmitted Diseases Committee on 22 January 2020, reports that no data on the presence of viral nucleic acid or infectious virus in blood have been reported to date for this coronavirus strain. Based on the rapid risk assessment from the European Centers for Disease Control, the committee recommends a brief travel deferral for blood donors returning from Wuhan, China as has been previously in the setting of SARS and MERS –Cov [9].

On 29 January 2020, based on this data, the **MNBC** recommended to Ministry of Health and to the MRBC :

- The need for MNBC's involvement in the National Epidemiological Surveillance System;
- Doctors of the medical selection information on the current epidemiological situation of the new coronavirus and the need to deepen the questionnaire for blood donors by looking for signs such as cough, fever, runny nose, diarrhea or vomiting;
- To take the temperature of donors at any suspicion of fever in a blood donor;
- Temporary deferral for a period of 28 days for anyone who has stayed in a country considered to be at risk on this virus or who has been in contact with a subject returning from a country at risk or who has presented recent respiratory symptoms of a viral nature;
- Information for blood donors on the need to take all the necessary preventive measures with regard to infection with this virus;

Thereafter, since the declaration of the first Moroccan case of patient infected with SARS-Cov- on **2 March 2020** and in line with the evolution of the national epidemilogical situation at SARS-CoV-2, the doctors of the medical selection in MRBC have been regularly informed about the update of the definition of the suspect case COVID-19 issued by the local health authorities. In according of this, on **15 March 2020**, the Moroccan Ministry of Health recommends that any COVID-19 suspect donor should be referred to the reference site of the Ministry of Health for the management of this case in the region concerned (Official site of the Ministry of Health) (10).

The quarantine of the plasma produced during this period

The World Health Organization (WHO), report on 28 February 2020 that the risk mitigation strategy with regard to SARS-CoV-2 may also include Quarantine of plasma for transfusion as a safety measure [2]. On 14 March 2020, the HCPH stipulate that Fresh frozen plasma that does not benefit from the pathogen mitigation technique is secured by quarantine [4]. **On 23 March 2020,** the **MNBC** recommanded quarantining all plasma produced by the MRBC from 01 February 2020 and not using it as therapeutic plasma. A national quarantine procedure has been drawn up by the national quality assurance service of the MNBC and sent to all MRBC. **On 05 May 2020,** given the difficulties expressed by the MRBC regarding the availability of therapeutic plasma following this decision, the MNBC updated this decision based on the scientific data available to date in relation with this new coronavirus and that reported the absence of any case of transmission of SARS-CoV-2 by blood products [4,5,11].

In according with this**, the MNBC** recommended the quarantine of the plasma produced by the Regional Blood Transfusion Centers from the date of 01 March 2020 and the use of plasma intended for fractionation as therapeutic plasma by the RBC involved in this process (Rabat, Oujda, Casablanca). Consequently, these RBC must henceforth orient all the plasma produced for the fractionation process.

No blood donation screening for SARS-CoV-2 virus

The potential for a viraemic phase of SARS-CoV-2 is currently not known and is likely to be limited to severe disease, analogous to other respiratory infections. With the current knowledge gaps there are too many uncertainties to recommend testing of blood donors for SARS-CoV-2 at present [2]. So far, suitable serological assays for SARS-CoV-2 have not been developed, although the diagnostic community has established NAT protocols for throat swabs. Testing throat swabs of blood donors would interrupt established routine test procedures without a confirmed increase of blood safety. The testing of the blood supply is premature in the absence of cases of transfusion transmission or

demonstrated infectivity of the COVID-19 virus in blood collected from asymptomatic persons [5].

On March 14 2020, the HCPH recommended that the genomic viral diagnosis of SARS-CoV-2 is not possible today on a large scale in blood establishments because the methods available to date are entirely manual and very demanding in terms of time and technical personnel. In addition, the cost-benefit ratio would be totally disproportionate. Indeed, this type of measure has never been mentioned in transfusion during other epidemics with respiratory viruses (pandemic influenza, SARS CoV, MERS-CoV ...), or even with haemorrhagic fever virus [4].

Also, the ECDC in the report risk assesment dated on Avril 29 2020, stipulate that blood donation screening is not possible at this time, given the absence of cases of transfusion transfusion to SARS-Cov -2 demonstrated to date and in the absence of currently validated techniques for screening for this new coronavirus in the blood donor population [11].

Based on this data the **MNBC** did not introduce any SARS-CoV-2 screening technique in Moroccan Blood Establishments.

For the pathogen inactivation technique

The Pathogen Reduction Technologies (PRTs), have been demonstrated to be effective against SARS-CoV and MERS-CoV in plasma and platelets [4,5]. However, PRT requires significant logistical and financial investment. PRT for whole blood is less widely available and studies of inactivation of coronaviruses in whole blood are lacking. Introduction of PRT for the COVID-19 virus in blood establishments would not be cost effective or proportionate and is not recommended [4,5].

THE MNBC RECOMMENDATIONS TO STRENGTHEN THE HAEMOVIGILANCE SYSTEM

A system must be in place for donors to report post-donation illness consistent with COVID-19 or contact with a case that is confirmed post-donation. Blood and components collected within 14 to 28 days of disease onset in the donor or after contact exposure may be recalled as a precautionary measure [2,4,5]. Although risk of transfusion transmission is theoretical, notification of the clinician of confirmed infection in the donor may also be considered if the blood or components have been transfused. Also, a haemovigilance system should be in place to capture any possible cases of transmission through blood and components. Haemovigilance is invaluable in helping to understand the risk from blood and components and the overall effectiveness of the measures taken by the blood service [2,4,5]. The blood service must ensure the reinforcement of the pre-donation examination (search for signs, even slight, suggestive of respiratory infection, search for cases of COVID-19 in the surrounding) and the reinforcement of post-donation information according to regulatory procedures [4].

Within this data, and given the current national epidemiological situation relating to SARS-CoV-2, **the MNBC** recommends **on 01 April 2020**:

- Strengthening the self-exclusion system for blood donors by adopting the new possible case definitions of COVID-19 from the Ministry of Health.
- Reinforcement of pre-donation interrogation and in particular the medical selection of donors by adopting the case definition of COVID-19 according to the updated recommendations of the Ministry of Health.
- Reinforcement of the post-donation information with particular attention during the 28 days following the donation, where the donor is required to inform the transfusion center of any evocative sign that could suspect an infection with SARS-CoV-2.
- Providing donors with the COVID-19 self-exclusion form prepared by the MNBC so that donors can provide feedback through the contact means available to them, namely telephone numbers and address electronic. Donors can be contacted at regular intervals after the donation for information to this effect.
- Reinforcement of the haemovigilance system at RBCT level and collaboration with care services for the establishment of traceability of blood products transfused during this critical period and for the collection of any transfusion incident whatever its nature.

THE MNBC RECOMMENDATIONS TO ENSURE THE SAFETY AND THE PROTECTION OF STAFF AND DONORS AGAINST COVID 19 INFECTION

Donor and staff safety is a priority for the MNBC. Measures have been issued since the start of the SARS-CoV-2 epidemic and reinforced after the declaration of the first case of SARS-CoV-2 in Morocco on **02 March 2020.**

The MNBC recommendations concern the implementation of protective measures to ensure security for both staff and blood donors and the reorganization of administrative activities :

- Providing blood donors and staff with appropriate protective measures: masks, gowns, gloves, shoes, antiseptic solutions, hydro alcoholic gel.
- Sensitization of blood donors on the need to apply all the necessary preventive measures with regard to infection with SARS-CoV-2.
- Compliance with barrier gestures and standard hygiene rules by collection staff and donors (hand hygiene, wearing of single-use gloves by the samplers….).
- Respect for the distancing measures recommended by the Ministry of Health for donors.
- Providing donors with the possibility of making an appointment with the RBCT to minimize the risk of donors gathering and condensing at the fixed RBCT sites.
- The programming of donations by group of 5 donors.
- The arrangement of reception areas in order to avoid any gathering in the medical selection process or while waiting for the sample.
- Reducing the number of meetings to urgent meetings and meetings for monitoring urgent and priority actions.
- Reduction of the number of meeting participants to a

maximum of 04 people for meetings that will be held in the meeting room and to 02 people for meetings in offices while respecting the distance of at least one meter and the port of surgical masks.

- Reducing the number of visitors to the administration premises.
- Continuous ventilation of premises and offices.
- The postponement of missions already scheduled at the national level during this period.

On 26 March 2020, the MNBC added these measures:

- Monitoring of standard biosecurity practices at RBCT laboratories.
- The establishment of a well-identified circuit of samples from suspect or infected COVID-19 patients received by RBCT as part of a request for LBP for blood transfusion.
- The organization of activities at the level of donation biological qualification laboratories so as to ensure continuity of work in this critical process even in the event of contamination of laboratory personnel.
- The establishment of a name list with reachable telephone number of retired staff or staff who have already worked in transfusion to request them in case of need of staff reinforcement and / or in case of reduction in the number of staff due to '' possible contamination by the new coronavirus.

THE MNBC RECOMMENDATIONS FOR THE MITIGATION OF THE IMPACT OF THE REDUCTION IN THE AVAILABILITY OF BLOOD DONORS AND LABILE BLOOD PRODUCTS

All international bodies such as the WHO, the ECDC and the HCPH had insisted from the start of the SARS-CoV-2 epidemic on the need to maintain a blood supply during this health crisis because the number of donors is likely to decrease due to restrictive measures taken by local authorities regarding displacement and also because of the fear that donors may feel towards the risk of infection with Sars-Cov-2 virus [2,4,5]. Systems should be in place to enable effective donor recruitment while respecting local restrictive measures.

Since **29 January 2020, the MNBC insisted** on in its first information note about the need to launch a National Companion of Blood Donation as soon as possible in order to ensure the availability of a sufficient national stock of Labile Blood Products during this critical period and to be able to meet the needs of patients in LBP in the event of possible epidemic.

The RBCT must have a LBP stock at least equal to 7 days to prevent any unforeseeable situation. A national blood donation campaign was organized by the MNBC in collaboration with several partners from **14 February 2020** and was very effective. After declaration of the first case on COVID-19 in Morocco on **02 March,** the number of donors has started to decrease and particularly after the introduction of restrictive measures concerning displacement issued by the Moroccan authorities from **19 March.**

To continue to ensure self-sufficiency in LBP during this critical period, the following measures have been recommended by the MNBC on **05 March 2020:**

- At the MNBC level, monitor the National Stock Status in Labile Blood Products daily.
- At the level of the MRBC, continuously monitor the local stock in PSL inform the MNBC in case of unavailability of a blood product so that it can ensure regulation and supply from another regional transfusion center blood.
- The transfusion centers at the level of the regions most affected by the epidemic will be supplied, if necessary, from the RBC in the least affected regions.
- Give special attention to critical blood products such as platelets, which have a limited lifespan to ensure constant availability for patients dependent on platelet transfusion.
- Continue to schedule blood donation collections by the RBCT while respecting the restriction measures recommended by the local authorities.
- Ensure a permanence in Regional Blood Donation Centers every day from 9 am to 7 pm.

But, following the evolution of the national epidemiological situation relating to SARS-CoV-2 (COVID-19), the MRBC have expressed a continuous decline in the reserves of Labile Blood Products due to the decrease in the number of donors. Also, the containment measures scheduled taken **on 14 March 2020** by the national authorities had worsen this situation by preventing citizens from going to transfusion centers to donate their blood.

Because of that, on **24 March 2020**, the MNBC added other recommandations :

- Make a call for blood donation from a government official;
- Authorize donors to come to the transfusion center on presentation of a document signed by the transfusion center containing the exact date and time of the donor's planned trip;
- Organize the movement of citizens to blood establishments while respecting the measures recommended by the Ministry of the Interior with the use of dedicated shuttles for this purpose.

THE MNBC RECOMMENDATIONS FOR THE MANAGEMENT OF BLOOD DEMAND

That the management of blood requests at the level of transfusion centers and at the level of care services during this critical period must be based on the concept of Patient Blood Management [2,5]. In this context, on **April 01** and on **May 05 respectively**, the MNBC recommends the strengthening of dialogue and collaboration with clinical services during this critical period. The implication of the care services for the management of requests for blood products and for joint consultation with the MRBC are imperative on clinical situations requiring urgent transfusions of Labile Blood Products. The MNBC insisted on the need to ensure the availability of labile blood products for polytransfused patients.

Since the beginning of the SARS-CoV-2 epidemic, the MNBC had effectively ensure the regulation between regional centers in case of need for Blood Products with particular attention an polytransfused patients (thalassemia, sickle cell anemia, chronic dialysis…) and patients requiring Stable Blood Products (hemophiliacs, patients in intensive care…).

THE MNBC RECOMMENDATIONS TO ENSURE THE SUPPLY OF CRITICAL MATERIAL AND EQUIPMENT

Since the beginning of the epidemic and since the declaration of the first Moroccan case, the MNBC has continued to supply the RBCT with all equipment, reagents and fungibles necessary for the continuity and smooth running of activities at the transfusion center level.

THE MNBC RECOMMENDATIONS TO ENSURE INTERNAL AND EXTERNAL COMMUNICATION

The blood service must communicate clearly to ensure that the national emergency response team, donors and recipients, and the public are properly informed and understand planned actions [5]. The communication strategy adopted by the MNBC during this health crisis is part of a quality approach based on the satisfaction of internal and external customers. So since **29 January 2020**, the MNBC has continued to regularly inform the local health authorities of all the measures taken by the MNBC in the field of blood transfusion and has updated the data transmitted to the RBCT about the new coronavirus. He has established an on-call list at the national level to respond to any request for information and to resolve any problem related to the availability of stable and labile blood products.

From the same date, the MNBC has, also, recommended to:

- Establish continuous communication with healthcare services.
- Create a sense of trust in blood donors to maintain the supply of blood products.
- Respond to questions and requests for information from donors regarding blood donation and the safety of blood donation during this epidemic.
- Inform donors about the availability of phone numbers for information on donating blood and making appointments.
- Respond to requests for information from the media and newspapers regarding blood donation.
- The RBCT must communicate to the MNBC the information relating to the stock of blood products.
- The RBCT must communicate to the MNBC the difficulties relating to the application of all the measures taken by the MNBC since the beginning of the epidemic.

THE MNBC RECOMMENDATIONS FOR ENROLLMENT IN A PROCESS OF THERAPEUTIC MANAGEMENT OF THE COVID-19 INFECTED PATIENT

COVID-19 convalescent plasma therapy

Results from documented small series of cases in previous MERS and SARS coronavirus outbreaks have shown faster viral clearance after administration of convalescent plasma, particularly when administered at the onset of disease progression [12]. According to current scientific publications, plasma treatment of convalescent COVID-19 has proven to be of great benefit in the management of patients infected with SARS-CoV-2. Its effectiveness concerned the improvement of clinical and radiological signs, the decrease in viral load, the stopping the use of invasive and non-invasive mechanical support after administration and an earlier hospital discharge rate compared to those who have not been transfused with convalescent plasma [12-15].

Clinical trials are still underway worldwide on the use of COVID-19 convalescent plasma.

In this context, on **April 15** the MNBC had established a clinical trial protocol on the use of COVID-19 convalescent plasma in patients infected with SARS-CoV-2 in Morocco. The Moroccan Protocol is based on OMS and European Commission recommendations [16,17].

The project has been submitted to the Ministry of Health and awaiting approval.

The supply of Stable Blood Products

The MNBC expressed a predisposition to ensure the supply for the COVID-19 infected patients in case of need for Stable Blood Products such immunoglobulins and albumin.

CONCLUSION

The Moroccan National Center for Blood is responsible for implementing the Ministry of Health's policy on blood transfusion and haemovigilance. Due to his multiple missions, he has ensured since the outbreak of the SARS-CoV-2 pandemic a health, epidemiological and scientific watch in order to ensure good management of this health crisis at the Moroccan blood transfusion centers. Several recommendations have been made by the MNBC to ensure effective support for transfusion centers and to ensure the availability and safety of blood products. These recommendations, of course, are subject to adjustment based on changes in current conditions.

Finally, it should be emphasized that through a strategy of listening, sharing and active communication, the staff of the various transfusion centers demonstrated exceptional dedication and incomparable commitment during this difficult period while demonstrating a positive reactivity to the recommendations established by the MNBC.

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The MNBC would like to thank all the staff of the Moroccan blood transfusion system, all the donors, all the collaborators for the efforts provided since the outbreak of this health crisis and which have made it possible, until then, to ensure good management of the SARS-CoV-2 pandemic and ensuring the availability of blood products to needy patients.

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