BRIEF REPORT

Erythrocyte sedimentation rate in COVID-19 patients treated at the CLAS health center, Nuevo Lurín, 2021 [version 1; peer review: awaiting peer review]

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Abstract

Background: The erythrocyte sedimentation rate (ESR) is used for diagnosis in inflammatory processes, including during the coronavirus disease 2019 (COVID-19) pandemic affecting our population. To determine the values of ESR in the evolution of patients with COVID-19 undergoing treatment at the CLAS Health Center in Nuevo Lurín.

Methods: Our research applied a quantitative-observational, descriptive, and longitudinal approach. The sample consisted of 26 male and 19 female patients treated at the study site between February and June 2021, none of whom were in critical condition. To collect all the necessary information, the Capillary or Wintrobe method was used to determine the values of ESR in the evolution of the COVID-19 patients, obtaining different values for the 45 patients seen at the study site. The normal ESR value was 0 - 15mm/h for males and 0 - 20mm/h for females.

Results: The initial ESR test in patients positive for COVID-19 showed that only two cases (0.04%) had slightly elevated ESR ranges, while in the rest of the values (95.56%) remained within the normal range.

Conclusions: From the results of the capillary velocity of sedimentation method, it can be concluded that patients with COVID-19 in Peru showed no signs of inflammation within their bodies due to the virus.
Keywords
erthrocyte sedimentation rate, capillary method, Wintrobe, COVID-19, ESR

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This article is included in the Coronavirus collection.

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**Introduction**

The coronavirus disease 2019 (COVID-19) pandemic started in China at the end of December 2019 and caused a great impact among the medical community due to the large number of infections and deaths, so that it was classified as a global public health emergency. So far, it is known that the disease is transmitted rapidly by bioaerosols from infected individuals and has an incubation period of five to eight days; it can generate an inflammatory response, which occurs between seven and 14 days after infection, being the period of greatest risk of aggravation of symptoms.

Any inflammatory process that is in the active stage generates an increase in the plasma concentration of various proteins, that together are known as reactive proteins. For example, in patients infected with SARS-CoV-2, an increase in ferritin, bilirubin, D-dimer, procalcitonin, erythrocyte sedimentation rate, transaminases, C-reactive protein, creatinine and lactate dehydrogenase has been observed. Although diagnosing the severe acute respiratory syndrome 2 (SARS-CoV-2) virus remains a challenge, laboratory tests have been the best tools so far.

The erythrocyte sedimentation rate (ESR) is a measure of the rate at which red blood cells from a blood plasma sample sediment over a given period. This is a test that indicates the body’s response to an inflammatory process, as well as being an inexpensive and simple test that is often requested in clinical practice; therefore, assessing ESR would be a predictive indicator of the evolution of critically ill patients.

A study conducted in Cuba in 2020 indicated that as part of its plan and protocol for coping with COVID-19, evaluation of ESR would be carried out during the monitoring of suspected and confirmed cases; therefore, the aim of the present study was to determine the values of ESR in the evolution of patients with COVID-19 treated at the CLAS Health Center; this study could be evidence and a precedent for Peru to also consider and use the ESR test as part of the diagnosis and follow-up of COVID cases.

**Methods**

**Study design**

The research was applied, quantitative-observational, descriptive, and longitudinal. The study population consisted of 1300 patients at the CLAS Nuevo Lurín health center, and the sample consisted of 26 male and 19 females patients treated at the study site between February and June 2021, none of whom were in critical condition.

Patients were studied at three points in time: on admission, at one month, and at two months. Written informed consent was obtained from each participant. This study was approved by the ethics committee of the Norbert Wiener Private University, which reviewed and approved the project set out in Resolution N°131-2022-DFFB/UPNM, approved by the Faculty of Pharmacy and Biochemistry of the same University.

**Data collection technique and instrument**

An observation sheet was used to record the values of ESR of COVID-19 patients seen at the CLAS Health Centre, Nuevo Lurín.

The data collection instrument, before being applied, was validated by the assessment of three experts in the area from the Norbert Wiener University.

**Methods for detection of erythrocyte sedimentation rate**

In order to collect all the necessary information, the Capillary or Wintrobe method was used to determine the values of ESR of the COVID-19 patients with time. The normal range of ESR values for evaluation was 0–15 mm/h for males and 0–20 mm/h for females, indicating the highest ESR velocity outside the range used. Various values were obtained from the 45 patients seen at the study site.

The following materials and instruments were used:

- Lancets – (Roche)
- Non-heparinized capillary tubes (Vitrex Medical)
- Cotton wool 50 g. (CKF)
As part of the biosafety protocols, the assessors used protective clothing such as: dust coveralls, PPE equipment (disposable apron, acrylic face shield, N-95 mask and footwear protectors).

Data processing and analysis
The procedure for the capillary method was carried out as follows:

1. To perform the sampling, the first step was to puncture the index finger, previously disinfected with alcohol, to extract blood using capillaries without heparin.

2. Once the blood was extracted, it was sealed with plasticine and placed vertically, writing the starting time; after one hour it was measured with the help of a millimetric ruler to obtain the values of the erythrocyte sedimentation rate.

Statistical methods
The data obtained were analyzed in SPSS version 25.0 statistical software, where the descriptive and inferential statistical analysis was carried out. The graphs and statistical tables were observed, which allowed us to carry out the interpretation and to be able to respond to the objectives of the study.

The reliability test was carried out, giving as a result a Cronbach’s Alpha of 0.882, resulting in an acceptable reliability of the instrument.

Results
According to Table 1, initial ESR testing of COVID-19-positive patients showed that only two cases had slightly elevated ESR ranges (0.04%), while the rest of the results (95.56%) were in the normal range.

Table 2 shows the ESR values taken from patients with COVID-19 at one month and two months of disease evolution, showing that both women (19 female patients) and men (26 male patients) had decreased ESR values within the normal range established for women and men at both times of evaluation, including the two cases initially observed that had ESR values outside the normal range (Underlying data).15

Discussion and conclusions
Despite the various studies that have been carried out on the management of COVID-19, it is still a challenge. Therefore, the aim of this research was to determine the values of the ESR of patients with COVID-19 treated at the CLAS Health Center with time, to observe whether there were elevated ESR values that indicated or gave indications of a severe case or subsequent sequelae.

The results show that the COVID-19 patients treated at the study site showed signs of ESR within normal ranges in both genders, thus inferring that COVID-19 does not generate a direct inflammatory influence on the organism in patients from Peru. Similarly, when monitoring ESR for a period of two months, it was found that patients had significantly decreased initial ranges of ESR, due to the treatment they were receiving. Gonzales et al.,12 found that male patients in their study sample showed signs of a significant decrease in ESR from the eighth day of treatment against COVID-19, generating a substantial improvement in inflammation within their general clinical picture.

Therefore, it is concluded that patients with COVID-19 in Perú did not show signs of inflammation within their organism due to the virus, through tests using the capillary ESR method; however, it is necessary to complement the ESR tests with other laboratory tests such as hemoglobin, Cr, LDH and C-reactive protein (CRP). As Ruiz13 reported in his article, it is important to recognize and promote the use of other laboratory tests that are available in hospitals to detect and track patients who may potentially develop severe COVID-19.13 Several studies have shown higher ESR values, along with C-reactive protein, ferritin, and decreased albumin independently of the presence of pneumonia.14 Therefore, these studies should serve as an early warning approach, and all patients with a positive COVID-19 test should be tested as soon as they are detected, as the outcomes of these cases are often severe.
### Table 1. Initial erythrocyte sedimentation rate (ESR) samples in male and female COVID-19 patients.

<table>
<thead>
<tr>
<th></th>
<th>2 mm/h</th>
<th>3 mm/h</th>
<th>4 mm/h</th>
<th>5 mm/h</th>
<th>6 mm/h</th>
<th>7 mm/h</th>
<th>8 mm/h</th>
<th>9 mm/h</th>
<th>10 mm/h</th>
<th>11 mm/h</th>
<th>20 mm/h</th>
<th>21 mm/h</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>Female</td>
<td>2</td>
<td>1</td>
<td>4</td>
<td>2</td>
<td>2</td>
<td>2</td>
<td>2</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>0</td>
<td>1</td>
<td>19</td>
</tr>
<tr>
<td>Male</td>
<td>5</td>
<td>2</td>
<td>5</td>
<td>4</td>
<td>2</td>
<td>2</td>
<td>1</td>
<td>3</td>
<td>0</td>
<td>1</td>
<td>1</td>
<td>0</td>
<td>26</td>
</tr>
<tr>
<td>Total</td>
<td>7</td>
<td>3</td>
<td>9</td>
<td>6</td>
<td>4</td>
<td>4</td>
<td>3</td>
<td>4</td>
<td>1</td>
<td>2</td>
<td>1</td>
<td>1</td>
<td>45</td>
</tr>
</tbody>
</table>

mm/h = millimetres per hour.

### Table 2. Erythrocyte sedimentation rate (ESR) samples in male and female COVID-19 patients obtained at one and two months of treatment.

<table>
<thead>
<tr>
<th></th>
<th>1 mm/h</th>
<th>2 mm/h</th>
<th>3 mm/h</th>
<th>4 mm/h</th>
<th>5 mm/h</th>
<th>6 mm/h</th>
<th>7 mm/h</th>
<th>8 mm/h</th>
<th>9 mm/h</th>
<th>10 mm/h</th>
<th>14 mm/h</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>1st month</td>
<td>Female</td>
<td>1</td>
<td>4</td>
<td>4</td>
<td>2</td>
<td>3</td>
<td>2</td>
<td>1</td>
<td>1</td>
<td>0</td>
<td>1</td>
<td>19</td>
</tr>
<tr>
<td></td>
<td>Male</td>
<td>1</td>
<td>9</td>
<td>6</td>
<td>3</td>
<td>2</td>
<td>2</td>
<td>1</td>
<td>0</td>
<td>1</td>
<td>1</td>
<td>0</td>
</tr>
</tbody>
</table>

|       | 2nd month | Female | 3      | 5      | 8      | 2      | 0      | 1      | -      | -       | -       | -       | 19     |
|       | Male     | 3      | 13     | 4      | 4      | 2      | 0      | -      | -       | -       | -       | -       | 26     |

mm/h = millimetres per hour.
This study had limitations to acknowledge: the small sample size is a recognized limitation of data research, and in view of the limited number of patients with COVID-19 attending the health center and the difficulty of collecting continuously available clinical data from patients. Therefore, further studies expanding the sample size and with data from surrounding districts are suggested for corroboration, as well as analysis of additional evidence.

**Data availability**

**Underlying data**


This project contains the following underlying data:

- DATA FEMALE.sav
- DATA MALE.sav
- initial and monthly ESR male.spv
- monthly and two months ESR Female.spv
- monthly and two months ESR male.spv

**Extended data**


This project contains the following extended data:

- ANEXXS.docx (supplementary materials)
- RESOLUCiON N° 131-2022.pdf (ethical approval letter)

Data are available under the terms of the Creative Commons Attribution 4.0 International license (CC-BY 4.0).

**References**


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