SAS Journal of Medicine
Abbreviated Key Title: SAS J Med
ISSN 2454-5112
Journal homepage: https://saspublishers.com

OPEN ACCESS

Hematology

Hemogram Characteristics of 257 Patients with COVID-19 in Meknes, Morocco

El Houcine Malki[1*], Mourad Belaouni[2], Hind Moussaoui[1], Rabii EL Bahraoui[3], Khalid Lahmadi[1,4]

[1]Department of Hematology, Moulay Ismail Military Hospital, Meknes, Morocco
[2]Department of Parasitology, Moulay Ismail Military Hospital, Meknes, Morocco
[3]Department of Microbiology, Moulay Ismail Military Hospital, Meknes, Morocco
[4]Faculty of Medicine and Pharmacy of Fez, Sidi Mohamed Ben Abdellah University, Fez, Morocco

DOI: 10.36347/sasjm.2024.v10i05.036 | **Received:** 14.04.2024 | **Accepted:** 23.05.2024 | **Published:** 27.05.2024

***Corresponding author:** El Houcine Malki
Department of Hematology, Moulay Ismail Military Hospital, Meknes, Morocco

Abstract **Original Research Article**

Background: Previous studies have shown that the abnormalities in blood routine parameters have certain clinical application value in predicting the progress of infectious diseases. Characteristics of peripheral blood cells as early signals were needed to be investigated for clarifying its associations with the fatal outcomes in COVID-19 patients. ***Methods:*** This study was conducted with an aim to examine the hematological findings of 257 patients diagnosed with COVID-19 over a 6-month period, from April 2020 to September 2020 in Moulay Ismail military hospital in Meknes. ***Results:*** Both sexes were present, with males predominating. The mean age of the total number of patients studied was 33.9 years (min: 1 max: 87 years). In our study, the first hematological abnormality was eosinopenia, present in 14.01% of patients. This was followed by lymphopenia in 13.62% of patients and neutrophilia in 12.45%. ***Conclusions:*** Patients with COVID-19 have abnormal peripheral blood routine examination results. Dynamic surveillance of peripheral blood system especially eosinophils and lymphocytes is helpful in the prediction of severe COVID-19 cases.

Keywords: COVID-19, Lymphocytes, Eosinophils, hematology.

INTRODUCTION

Coronavirus disease 2019 (COVID-19), which was first identified in Wuhan, China in late December 2019, spread rapidly all over the world and was declared as a pandemic by the World Health Organization (WHO) on March 11, 2020.1 COVID-19 is a highly infectious viral infection caused by the severe acute respiratory syndrome coronavirus [1] (SARS-CoV-2). In the early stages of this disease, symptoms of severe acute respiratory infection occur, with some patients rapidly developing acute respiratory distress syndrome (ARDS) and other serious complications, which are eventually followed by multiple organ failure [2]. Therefore, early diagnosis and timely treatment of critical cases is very crucial.

Previous studies have shown that the abnormalities in blood routine parameters have certain clinical application value in predicting the progress of infectious diseases [3,4]. At the same time, Guan *et al.*,'s analysis of clinical characteristics of 1099 patients with COVID-19 showed abnormal parameters of lymphocytes and platelets in peripheral blood of some patients [5]. So, in order to further analyze the clinical application value of blood routine parameters in diagnosis and treatment of COVID-19, the changes of peripheral blood routine parameters of 257 patients with COVID-19 in Moulay Ismail military hospital in Meknes were retrospectively tracked and analyzed, which are reported as follows.

MATERIALS AND METHODS

Study Subjects

We conducted a retrospective study on COVID-9 patients over a 6-month period, from April 2020 to September 2020 in Moulay Ismail military hospital in Meknes. The patients were diagnosed according to the World Health Organization guidance for COVID-19. The fluorescent re verse transcription-polymerase chain reaction was used to confirm each diagnosis made from the nasopharyngeal swab. two hundred and fifty-seven patients, aged 1 to 87 years, were recruited for the study. They comprised 31 females and 226 males. Blood samples were collected from each participant and then used for hematological investigations.

Patients with hematological diseases or blood transfusion during hospitalization were excluded.

Clinical laboratory data

Routine blood tests (white blood cell [WBC] count, lymphocyte count [LYM], mononuclear count [MONO], neutrophils count [NEU], Hgb level, platelet value) were performed on the blood samples, using SYSMEX XT-2000i automated hematology analyzer.

Statistical Analysis

Statistical analyses were performed using Statistical Package for the Social Sciences (SPSS) version 20.0. The descriptive statistics of the numerical parametric variables were calculated as mean ± standard deviation, and non-parametric variables were calculated as the median, and categorical variables were expressed as a percentage. While evaluating the study data, the suitability of the parameters of normal distribution was evaluated by the Shapiro–Wilk test, and the student's t-test was used to compare the groups. P-values based on two-sided tests were considered statistically significant at less than 05.

RESULTS

A total of 257 patients with a specific diagnosis of COVID-19 with SARS-CoV-2-positive RT-PCR were evaluated retrospectively. A total of 226 (87.9%) of the patients were male and 31 (12.1%) were female. The mean age of the patients was found to be 33.9 years (1-87 years). a total of 84 (33%) patients were symptomatic compared with 173 (67%) who were asymptomatic. The average age of symptomatic patients was 36.14, compared with 31.97 for asymptomatic patients. When the laboratory parameters of the patients were examined, the percentage of anemia in our patients was 8.17%, while 91.83% showed no abnormality of the erythrocyte lineage. anemia was more common in women (12.9%) than in men (7.52%). The hematological characteristics of the patients are summarized in Table 1. leukopenia was found in 20 (7.8 %) patients and leukocytosis in 22(8.5 %) patients; the leukocyte count was within the normal range in 215 (83.6%) patients. 16 patients (6.2%) were diagnosed with neutropenia. Lymphopenia was reported in 35 (13.6%) patients. Lymphocytosis was observed in 2 patients (0.9%) and normal lymphocytes were seen in 220 patients (85.5%). 21 patients (8.2%) in the study had monocytosis, while 236 patients (91.8%) had monocytes in the normal range. Eosinopenia was observed in 36 (14%) patients. Thrombocytopenia was observed in 26 (10.2%) patients. Thrombocytosis occurred in 8 patients (3.1%). The hematological characteristics of the patients are summarized in Table 1.

DISCUSSION

Studies in Wuhan have shown that the majority of Covid-19 patients are adult males.

63.7% of patients were male in the study by Wu *et al.*, 58.1% and 62% in the studies by Guan *et al.*, and Zhou *et al*, respectively [6-8]. This difference may be explained by the higher frequency of risk factors for disease severity in the male population.

Table 1: abnormalities observed in our study

	Number	Percentage
Eosinopenia	**36**	**14%**
Lymphopenia	**35**	**13.6%**
Thrombopenia	26	10.1%
Neutrophilia	32	12.4%
Anemia	21	8.2%
Monocytosis	21	8.2%
Neutropenia	16	6.2%
Thrombocytosis	8	3.1%
Lymphocytosis	2	0.9

Our study found a clear predominance of males (n=226) 87.93%, against 12.07% of females (n=31). The sex ratio was 7.29.

This finding can be explained by the fact that the military population is predominantly male.

similar to the literature, the mean age of our patients was 33.9 years, with extremes ranging from 1 to 87 years. Our symptomatic patients (n=63) had an average age of 36.14, compared with 31.97 for asymptomatic patients (n=129).

A review of the clinical, biological and radiological characteristics of adults, pregnant women and children found that age over 50 years was strongly associated with the development of ARDS, and age over 65 years was associated with mortality [8].

In adults, the most common hematological findings of COVID-19 are lymphopenia, neutrophilia, and thrombocytopenia. 23-27 In another study comparing COVID-19 patients with other viral disease patients, results of leukopenia, lymphocytopenia, and eosinopenia results were found to be more frequent in COVID-19 patients [1].

The majority of patients with COVID-19 have lymphopenia [5,9], which is associated with the severity of the disease, with total lymphocyte levels appearing to be lower in patients with severe forms and in patients who have died [7,9,10].

In our work, lymphopenia was found in 13.62% of patients, 21.21% of symptomatic cases (n=66) of SARS-COV2 infection developed lymphopenia, compared with 9.02% of asymptomatic cases (n=133). This rate is much lower than that found by LI *et al.*, [11], who observed the following results: lymphopenia in 77.42% of patients in the SARS-COV2 nucleic acid-positive group (n=31), compared with 69.57% in the

SARS-COV2 nucleic acid-negative group (n=23). The same observation was made in the study by Professor Chaolin Huang (professor at the jin yin-tan hospital in Wuhan, China). this study showed a high rate of patients suffering simultaneously from Covid and lymphopenia. In fact, out of 41 patients hospitalized following infection with SARS-COV2, 26 suffered from lymphopenia (63%). Thus, all these reports suggest that lymphopenia is a strong indicator of covid infection 19.

In our study, neutrophilia was found in 32 patients, i.e. 12.45% of cases in our sample. The results were as follows: 6.76% of asymptomatic patients and 21.21% of symptomatic patients. However, according to a study by Wu (n = 201) [8], neutrophilia was found in 34.5% of symptomatic patients with SARS-CoV-2.

In our study, monocytosis was found in 21 patients (8.17%) of the total number of patients. However, the rate of monocytosis in the study by G-Q QIAN *et al.*, [12] was much higher than in our study, i.e. 19.78% of patients on admission. In both cases, this anomaly may be considered as a factor linked to SARS-COV2 infection.

Table 2: Comparison of hemogram abnormalities between our study and other studies

	Qian (Zhejiang) n=91	**Liu (chugging) n=51**	**Huang (Wuhan) N=41**	**Our series (Meknes) N=257**
Eosinopenia	51.65%	-	-	14.01%
Lymphopenia	30.77%	51%	63%	13.62%
Neutrophilia	3.30%	21.6%	-	12.45%
Thrombocytopenia	10.99%	19.6%	5%	10.12%
Monocytosis	19.78%	-	-	8.17%
Anemia	36.26%	-	-	8.17%

A study of the immune response to SARS-CoV-2 and mechanisms of immunopathological changes in COVID-19 showed that, in addition to lymphopenia, Eosinopenia was observed in 73 out of 138 (52.9%) hospitalized cases of serous COVID-19. To support this association between eosinopenia and the severity of SARS-COV2 infection, Chuan Qin [10] (professor at Shanghai University of Science and Technology) compared the eosinophil count in severe and moderate patients in his study. He found 0% in the former and 0.2% in the latter.

Several studies have suggested that eosinophil counts below normal levels could be a viable biomarker for the diagnosis of COVID-19. Changes in differential peripheral blood leukocyte counts in patients with COVID-19 and patients with other viral pneumonia were compared. While 70% of patients in the COVID-19 group had eosinopenia, only 16.7% of patients in the non-COVID-19 viral pneumonia group had eosinophil counts below normal levels [13]. In our study 14.01% of these COVID-19 patients had eosinopenia.

Several studies have shown how thrombocyte count can help in the identification of covid 19, as well as in the differentiation of covid 19 and non-covid 19 infections. Two meta-analyses, the first by Soraya and ulhaq and the second by Lippi *et al.*, concluded that: on the one hand, once thrombocytopenia is diagnosed in a patient, it is highly likely that he or she is simultaneously infected with covid-19, and on the other hand, this SARS-COV2 infection would be severe. Thrombocytopenia must therefore be assessed throughout the management of the patient.

Our study included 26 patients with thrombocytopenia, i.e. 10.12% of our total number of patients. In addition, in a sample of 91 patients with covid-19, 10.99% were diagnosed with thrombocytopenia on admission; a result observed at the end of the study carried out by G-Q QIAN *et al.*, [12]. In another study, the rate of patients with this anomaly, among a sample of 51 covid patients, was 19.6% at the end of the study carried out by the (Department of Nephrology at the Three Gorges Central Hospital in Chongqing, China "Lei Liu"[14]).

CONCLUSION

In summary, our work is important to demonstrate hematological documentation in patients with COVID-19. Early identification of risk factors for critical illness can facilitate appropriate provision of supportive care and help reduce mortality. Blood routine seems like a convenient and effective indicator which can help to identify the entities involved in immune dysregulation. Lymphopenia and eosinopenia on admission may be particularly important indicator value for judging the progression and prognosis of COVID-19.

REFERENCES

1. Shereen, M. A., Khan, S., Kazmi, A., Bashir, N., & Siddique, R. (2020). COVID-19 infection: Emergence, transmission, and characteristics of human coronaviruses. *Journal of advanced research*, *24*, 91-98.
2. Chen, N., Zhou, M., Dong, X., Qu, J., Gong, F., Han, Y., ... & Zhang, L. (2020). Epidemiological and clinical characteristics of 99 cases of 2019 novel coronavirus pneumonia in Wuhan, China: a descriptive study. *The lancet*, *395*(10223), 507-513.

3. Jan, H. C., Yang, W. H., & Ou, C. H. (2019). Combination of the preoperative systemic immune-inflammation index and monocyte-lymphocyte ratio as a novel prognostic factor in patients with upper-tract urothelial carcinoma. *Annals of surgical oncology*, *26*, 669-684.
4. Demirdal, T., & Sen, P. (2018). The significance of neutrophil-lymphocyte ratio, platelet-lymphocyte ratio and lymphocyte-monocyte ratio in predicting peripheral arterial disease, peripheral neuropathy, osteomyelitis and amputation in diabetic foot infection. *Diabetes research and clinical practice*, *144*, 118-125.
5. Guan, W. J., Ni, Z. Y., Hu, Y., Liang, W. H., Ou, C. Q., He, J. X., ... & Zhong, N. S. (2020). Clinical characteristics of coronavirus disease 2019 in China. *New England journal of medicine*, *382*(18), 1708-1720.
6. Guan, W. J., Ni, Z. Y., Hu, Y., Liang, W. H., Ou, C. Q., He, J. X., ... & Zhong, N. S. (2020). Clinical characteristics of coronavirus disease 2019 in China. *New England journal of medicine*, *382*(18), 1708-1720.
7. Zhou, F., Yu, T., Du, R., Fan, G., Liu, Y., Liu, Z., ... & Cao, B. (2020). Clinical course and risk factors for mortality of adult inpatients with COVID-19 in Wuhan, China: a retrospective cohort study. *The lancet*, *395*(10229), 1054-1062.
8. Wu, C., Chen, X., Cai, Y., Zhou, X., Xu, S., Huang, H., ... & Song, Y. (2020). Risk factors associated with acute respiratory distress syndrome and death in patients with coronavirus disease 2019 pneumonia in Wuhan, China. *JAMA internal medicine*, *180*(7), 934-943.
9. Huang, C., Wang, Y., Li, X., Ren, L., Zhao, J., Hu, Y., ... & Cao, B. (2020). Clinical features of patients infected with 2019 novel coronavirus in Wuhan, China. *The lancet*, *395*(10223), 497-506.
10. Qin, C., Zhou, L., Hu, Z., Zhang, S., Yang, S., Tao, Y., ... & Tian, D. S. (2020). Dysregulation of immune response in patients with coronavirus 2019 (COVID-19) in Wuhan, China. *Clinical infectious diseases*, *71*(15), 762-768.
11. Li, Y. Y., Wang, W. N., Lei, Y., Zhang, B., Yang, J., Hu, J. W., ... & Lu, Q. F. (2020). Comparison of the clinical characteristics between RNA positive and negative patients clinically diagnosed with coronavirus disease 2019. *Zhonghua jie he he hu xi za zhi= Zhonghua jiehe he huxi zazhi= Chinese journal of tuberculosis and respiratory diseases*, *43*(5), 427-430.
12. Qian, G. Q., Yang, N. B., Ding, F., Ma, A. H. Y., Wang, Z. Y., Shen, Y. F., ... & Chen, X. M. (2020). Epidemiologic and clinical characteristics of 91 hospitalized patients with COVID-19 in Zhejiang, China: a retrospective, multi-centre case series. *QJM: An International Journal of Medicine*, *113*(7), 474-481.
13. Li, Y. X., Wu, W., Yang, T., Zhou, W., Fu, Y. M., Feng, Q. M., & Ye, J. M. (2020). Characteristics of peripheral blood leukocyte differential counts in patients with COVID-19. *Zhonghua nei ke za zhi*, *59*(5), 372-374.
14. Liu, L., Gao, J. Y., Hu, W. M., Zhang, X. X., Guo, L., Liu, C. Q., ... & Xiao, J. F. (2020). Clinical characteristics of 51 patients discharged from hospital with COVID-19 in Chongqing, China. *MedRxiv*, 2020-02.