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Haematological changes in sailors who had COVID-19

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ABSTRACT

Background: *Follow-up of patients who had coronavirus disease 2019 (COVID-19) proves that clinical symptoms persist for months after recovery. A complex of such persistent manifestations is defined as the post-COVID-19 syndrome. One of the criteria for post-COVID-19 syndrome may be typical changes in white blood cell count and white blood cell (WBC) differential. The aim of the work is to study the frequency of haematological changes in sailors who had the acute coronavirus infection.*

Materials and methods: *The retrospective study covered 30 candidate sailors aged 21 to 60 years with a history of COVID-19 and persistent changes in the WBC count and WBC differential and who did not have haematological abnormalities during the previous medical examinations.*

Results: *Analysis of WBC and WBC count at the long-term period after COVID-19 confirmed persistent changes in the form of neutrophilia, lymphopenia, changes in the neutrophils and lymphocytes ratio. The revealed changes in the WBC count were typical and fit into several patterns: A. Absolute leukocytosis, absolute and relative neutrophilia, relative lymphopenia; B. Relative and absolute lymphopenia, relative neutrophilia; C. Relative and absolute lymphocytosis, relative neutropenia; D. Relative lymphopenia, without other changes in WBC differential.*

Conclusions: *The most typical laboratory change in WBC count in patients with the past COVID-19 is relative or absolute leukopenia. Persistent changes in WBC count are not always outside of the reference range for absolute values and should be assessed by a complex of typical changes. The presence of typical changes in WBC count in a patient with the past COVID-19 requires a profound examination for the post-COVID-19 syndrome.*

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Key words: coronavirus disease 2019 (COVID-19), post-COVID syndrome, lymphopenia, sailors

INTRODUCTION

Laboratory diagnosis is a leading factor in the fight against the coronavirus disease 2019 (COVID-19) pandemic [1]. Persistent changes in white blood cell (WBC) count can act as confirmation of viral aetiology of clinical manifestations and prove post-COVID-19 syndrome [2, 3]. Due to a healthy lifestyle, self-control and regular medical examinations most of sailors are relatively young and healthy, as evidenced by the results of annual pre-employment inspection. That is why, if health changes are detected after a coronavirus infection, they confirm post-COVID-19 syndrome with a high degree of accuracy.

The aim of this work is to study the frequency of haematologic disorders in sailors who had acute coronavirus infection.

MATERIALS AND METHODS

The study is retrospective. It was performed in the medical centre providing medical services to sailors ("Vivamed", Odessa, Ukraine). The patients were selected during

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pre-employment medical examinations. For the period from 30.12.2021 to 02.02.2022, 30 people were detected with WBC count disorders. All the sailors were men, European race. The age of patients ranged from 21 to 60 years; the median was 40 years (30–52).

Laboratory findings with reference values of indicators were obtained from the digital system of the medical centre laboratory. The detected changes in WBC count were interpreted in accordance with generally accepted standards, with the identification of patterns. The patient informed consent for participation in the study was obtained. It was documented by the bilateral signing of the contract.

RESULTS

Analysis of the previous medical examinations of the sailors who participated in the study revealed no significant changes in WBC count. All patients had COVID-19 from 1 to 6 months before the medical examination (mainly during the autumn 2021 epidemic), which was confirmed by relevant medical documents (medical reports, PCR results, express tests, serological tests).

The identified shifts in WBC count of sailors corresponded to absolute leukocytosis in 13 (43.3%) cases, absolute neutrophilia — 15 (50%), absolute lymphopenia — 5 (16.7%), absolute lymphocytosis — 1 (3.3%), relative neutrophilia — 22 (73.3%), relative lymphopenia — 27 (90%), relative lymphocytosis — 3 (10%), relative neutropenia — 3 (10%) (Fig. 1).

The rates of absolute leukocytosis in candidate sailors after COVID-19 ranged from 9.4 to 14.8 g/L, median — 11.4 g/L (10.3–12.5); absolute neutrophilia — from 7.0 to 12.0 g/L, median — 8.9 g/L (10.3–12.5); absolute lymphopenia — from 0.3 to 1.2 g/L, median — 0.8 g/L (0.6–1.0). There was also a single case of absolute lymphocytosis — 4.7 g/L. Reference values: white blood cells — 4.0–9.0 g/L; neutrophils — 1.5–7.7 g/L; lymphocytes — 1.1–4.5 g/L (Fig. 2).

The values of relative neutrophilia in patients after the past COVID-19 ranged from 77.1 to 86.7%, the median was 80.6% (77.6–83.6); relative lymphopenia — from 8.8 to 19.6%, median — 14.4% (10.5–18.3). The level of monocytes corresponded to the reference values and ranged from 2.1 to 9.6%, the median was 5.4% (4.3–7.9). Reference values: neutrophils — 42.0–77.0%; lymphocytes — 20.0–44.0%; monocytes — 2.0–10.0%. Also, among sailors, 3 cases of relative lymphocytosis (42.7%; 46.8%; 43.4%) were detected in combination with relative neutropenia (42.4%; 45.8%; 43.7%) (Fig. 3).

The changes revealed in the general blood analysis were mainly typical and fit in several patterns:

— A. Absolute leukocytosis, absolute and relative neutrophilia, relative lymphopenia (n = 15) — shifts in this pat-

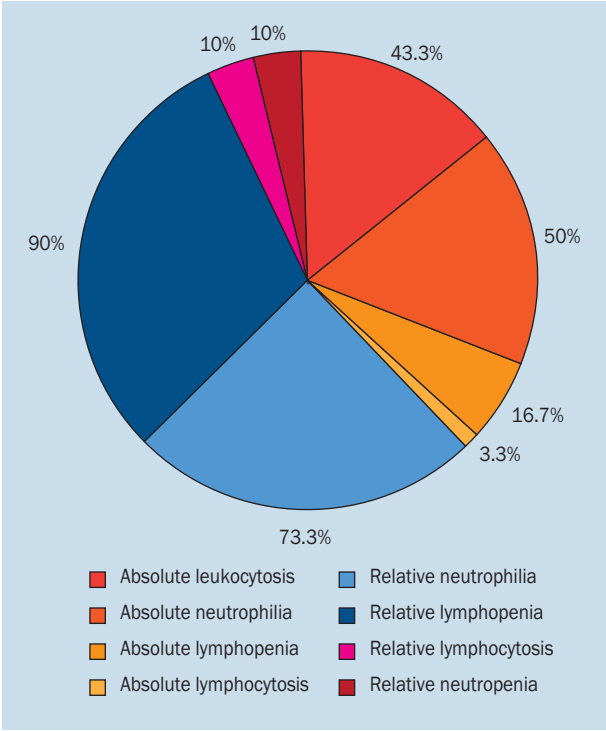

Figure 1. Variants of changes in white blood cell differential of sailors who had COVID-19

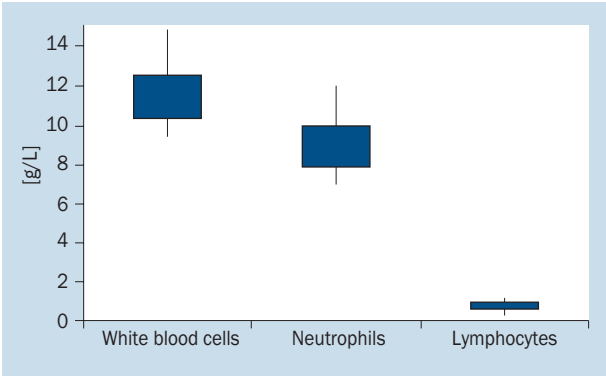

Figure 2. Absolute changes in white blood cell count in sailors after COVID-19

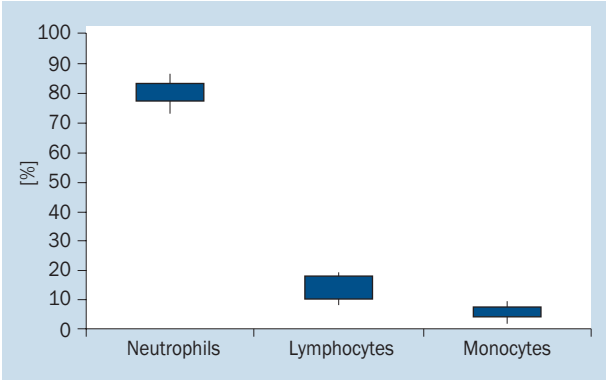

Figure 3. Relative changes in white blood cell count in sailors after the past COVID-19

Table 1. White blood cell differential shift patterns in sailors who had COVID-19

Pattern	White blood cell differential				
	Absolute white blood cells [g/L]	Absolute neutrophils [g/L]	Relative neutrophils [%]	Absolute lymphocytes [g/L]	Relative lymphocytes [%]
Pattern A. Patient K., 34 years old	11.0	8.7	78.6	1.7	15.8
Pattern B. Patient L., 49 years old	7.5	6.5	86.1	0.8	10.5
Pattern C. Patient T., 26 years old	7.6	2.3	30.5	4.7	61.8

tern were due to the apparent absolute growth of neutrophils. All 4 or at least 3 of 4 signs (for example, without absolute leukocytosis);

- B. Relative and absolute lymphopenia, relative neutrophilia (n = 10) — shifts in WBC count were due to a decrease in lymphocytes;
- C. A relative and absolute lymphocytosis, relative neutropenia (n = 3) — changes in WBC count due to an increase in lymphocytes to the upper limit of the reference value or higher against the background of a decrease in neutrophils to the lower limits of absolute values;
- D. Relative lymphopenia (n = 2) without other changes in WBC count (Table 1).

DISCUSSION

Sailors, as a cohort of workers having periodic medical examinations, can be considered as a subject for studying the consequences of COVID-19. However, this approach has certain limitations, as the sailor candidates often hide the non-obvious complaints and functional impairments. The impact of the coronavirus infection caused by COVID-19 on laboratory blood parameters differs significantly from other viral infections by duration and variety of manifestations and requires additional studies.

Persistent changes in WBC count at the long-term period after the past COVID-19 have several typical manifestations, such as neutrophilia, lymphopenia, a change in the neutrophils and lymphocytes ratio.

The presence of typical patterns in WBC count suggests that clinical symptoms at the long-term period in patients who had COVID-19 are a manifestation of post-COVID-19 syndrome.

CONCLUSIONS

The most common laboratory change in WBC count in COVID-19 survivors is relative or absolute lymphopenia. Persistent changes in WBC count do not always go outside of the reference values for absolute values and should be assessed by combination of typical changes.

Conflict of interest: None declared

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