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ORIGINAL ARTICLE

COVID-19 in the Emergency Department of the Primary Healthcare Centre Banja Luka

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Abstract

Background / Aim: COVID-19 is acute virus disease caused by the Severe Acute Respiratory Syndrome Coronavirus 2 (SARS–CoV-2). It was proclaimed as pandemic starting from March 2020 and is still ongoing. COVID-19 pandemic forced all segments of the society, particularly the health sector, to function in changed and aggravating circumstances and because of the transmission and new strains of the virus it resulted in the change of the number of infected people with peaks and oscillations. Aim of this study was to make analysis of the data related to COVID-19 positive/suspect patients examined in the Primary Healthcare Centre Banja Luka in the period 15 March 2020 – 15 March 2021, which refers to the incidence of the infected persons, sex and age representation, laboratory diagnostics and clinical parameters, applied therapy, as well as the number of patients sent for the hospital treatment.

Methods: Data for the analysis were obtained by the retrospective analysis of the statistical data from the electronic medical record of the examined COVID-19 positive/suspect patients in the Outpatient Clinic for Acute Respiratory Infections (ARI) and in the field. Pearson's χ^2 test of contingency was used for the comparison of differences of the observed characteristics of the examined groups.

Results: Personnel of the Emergency Department (ED) of the Primary Healthcare Centre Banja Luka, in the period 15 March 2020 – 15 March 2021, examined the total of 3,937 COVID-19 positive patients and patients suspect of COVID-19. Out of that number, 3,601 patients were examined in the ED – ARI and 336 patients were examined in the field. The biggest number of patients was registered in November 2020 (768). Male sex prevailed (55.50 %) and patients of 20-50 years of age were most represented. There were 3.10 % of those highly febrile patients and 2.5 % of those with low SpO_2 of under 90 %. 14.90 % of patients had higher values of troponin T and 45.50 % of them had higher values of D-dimer. In the field, 69.60 % of patients had pathological changes on lungs and 33.30 % had pathological ECG report. The number of patients sent from the ARI for further diagnostic procedure or hospitalisation to the Clinic for Infectious Diseases of the University Clinical Centre of Banja Luka was 1,191 and 258 patients were sent from the field.

Conclusion: For the purpose of preventing the spread of epidemics, the ED reorganised the existing space by introducing temporary clinics – containers for the patients with acute respiratory infections and febrile status, COVID-19 suspects. Clinical parameters changed depending on the new virus strains, as well as on age distribution and infection complications.

Key words: COVID-19; Emergency Department; Outpatient Clinic for Acute Respiratory Infections; Clinical parameters.

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Introduction

COVID-19 is acute virus disease caused by the Severe Acute Respiratory Syndrome Coronavirus 2 (SARS–CoV-2). Coronaviruses most often caused mild infections of upper respiratory airways of people. However, in the last 20 years, coronaviruses caused three epidemics of global importance.[1] In March 2003, the World Health Organization proclaimed the epidemic of so far unknown respiratory disease which was called Severe Acute Respiratory Syndrome - SARS, the cause of which was coronavirus SARS-CoV-1. In 2012, there appeared a new infection caused by the coronavirus and was called Middle East Respiratory Syndrome - MERS. The cause of this disease was the coronavirus called MERS-CoV. The latest epidemic caused by the coronavirus is represented by the still ongoing pandemic of the disease caused by the novel coronavirus 2019, later renamed SARS-CoV-2.[2] SARS-CoV-2 virus belongs to the group of RNA viruses, is composed of one-member ribonucleic acid and is transferred by respiratory drops or in a close contact. The virus has four structural proteins: S protein spike, E protein envelope, membrane protein and nucleocapsid protein. SARS-CoV-2 enters the host cells by bonding with the receptor angiotensin – converting enzyme 2 (ACE2-R), while the chief protein for entering the host cells is Spike protein.[3]

According to the seriousness of the clinical picture of the patients with confirmed COVID-19 infection, the patients are divided in groups: asymptomatic cases, mild, moderately serious, serious and very serious clinical picture.

- **Mild clinical picture**: Clinical symptoms are mild fever, headache, stuffy nose, weakness, loss of the sense of smell and taste, pain in muscles.
- **Moderately serious clinical picture**: Patients are with or without comorbidities with present pneumonia with signs of hypoxia, without signs of dehydration, sepsis or shallow breathing.
- **Serious clinical picture**: This group mostly involves patients with comorbidities and more extensive pneumonia, heavy hypoxia followed by fever. Around 15 % of patients have a more serious form of pneumonia, which is characterised by significantly heavy breathing with the lesions spreading to more than 50 % of the pulmonary parenchyma, number of respirations is > 30 in a minute and saturation of arterial blood by oxygen (SaO_2) < 90 %.
- **Very serious clinical picture**: This is a critical state appearing with around 5 % of the infected patients. The patients show signs of diffuse pulmonary parenchyma, followed by the vascular permeability, appearance of infiltrates and loss of pulmonary function. Critically infected patients require treatment in the intensive care units.

COVID-19 infection is the disease linked with the significantly increased rate of cardiovascular diseases. Although the mechanism has still not been sufficiently clarified, it is possible that the undetected acute coronary syndrome, cardiac arrhythmia and high rate of arterial and venous thrombosis are the reason for unexplained cardiac arrests, which increases mortality out of and in hospitals.[4] COVID-19 is also related to the broad spectrum of cardiovascular sequelae, including acute cardiac insufficiency, arrhythmia, acute coronary syndrome, myocarditis and cardiac arrest. However, cardiac impairments correlate also with the increased intra-hospital mortality with COVID-19 patients.[5]

COVID-19 pandemic caused an increased level of fear in patients, so that they avoided visits to health institutions exactly because of fear of getting infected and they asked for medical assistance only in case of dire need.[6] Research showed that the patients with cardiovascular diseases and comorbidities (diabetes and high blood pressure) ran a higher risk of getting bad results of COVID-19 treatment.[7] Severe cardiovascular complications appear with around 10 % to 20 % of hospitalised patients. According to the summary analyses, it is assumed that around 20 % of patients (in the scope of 5 % to 38 %) have an acute myocardial damage during COVID-19, depending on the used criteria.[8-10] Direct and indirect effects of SARS CoV-2 infection, like serious immunological response, advance of critical disease and hypoxia, can result in the development of thrombotic incidents, like disseminated intravascular coagulation (DIC).[11] COVID-19 is systemic, potentially serious and life-threatening disease, initiated by the SARS-CoV-2 infection, which includes immunological and inflammatory responses, dysfunction of endothelial cells and hyper-coagulant state. The period of incubation lasts from two to 14 days, with the median of five to six days. Infection may be asymptomatic or presented in different symptoms which involve mild symptoms of upper respiratory airways, cytokine storm, failure of several organs, sepsis and coagulopathy related to COVID-19, which causes serious thrombot-

ic complications.[12-14] COVID-19 pandemic forced the whole world and all segments of the society and particularly the health sector, to function in extraordinary and changed circumstances. The Emergency Department (ED) got adjusted to the new situation with the goal to protect the personnel and patients and not to endanger for a single moment the provision of health care. The triage of patients at the reception and introduction of the triage questionnaire and epidemiological survey contributed to the decrease of spread of infection, by classifying COVID-19 positive patients and patients suspect of COVID-19 separately from the patients with other diagnoses. The introduction of improvised outpatient clinics for acute respiratory infections was necessary in order to decrease the spread of infection. Personnel of the ED, in the period of 15 March 2020 -15 March 2021, treated the total number of 3,937 COVID-19 positive patients and patients suspect of COVID-19. Out of that number, 3,601 patients were examined in the Outpatient Clinic for Acute Respiratory Infections (ARI) of the ED and 336 patients were examined in the field.

Aim

Aim of this study was to make analysis of the data related to COVID-19 positive/suspect patients and clinical parameters with those patients examined in the ED in the period 15 March 2020 – 15 March 2021, which refer to the incidence of the infected persons, sex and age representation, laboratory diagnostics and clinical parameters, applied therapy and the number of patients sent for the hospital treatment.

Methods

The data for the analysis were obtained by the retrospective analysis of the statistical data from the electronic medical record of the examined COVID-19 positive/suspect patients by the use of electronic Web Medic program. The anonymity of the patients was preserved, because the data used were only those referring to the age and sex, without using names, family names, initials or date of birth. The study was approved by the Ethical Committee of the Primary Healthcare Centre Banja Luka. The following parameters were analysed: sex, age, COVID-19 incidence, body temperature, saturation of blood with oxygen, auscultatory findings on lungs, blood pressure, electrocardiogram (ECG) report, values of D-dimer, troponin, C reactive protein (CRP), leucocytes, lymphocytes, number of patients sent to hospital for treatment, prescribed therapy.

The data were presented in the form of distribution of frequencies. Pearson's χ^2 test of contingency was used for the comparison of differences of the observed characteristics of the examined groups. Statistically important values were p values in which $p < 0.05$. Software IBM SPSS Statistics 24.0 and MS Excel 2019 were used for the statistical analysis and graphical presentation of the data.

Results

The personnel of the ED of Primary Healthcare Centre Banja Luka examined the total of 3,937 COVID-19 positive/suspect patients in the period of 15 March 2020 – 15 March 2021. Out of that number, 3,601 patients were examined in the ED ARI and 336 patients were examined in the field. The lowest incidence of COVID-19 positive/suspect patients examined in the ARI was in the period March – August and then started to rise reaching the peak in the month of November (Figure 1).

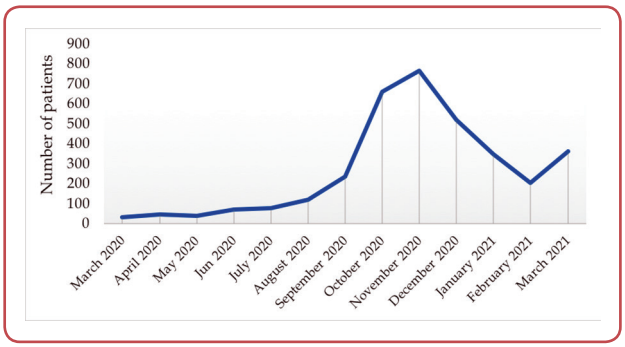

Figure 1: Incidence of COVID-19 positive/suspect patients in the Outptient Clinic for Acute Respiratory Infections (ARI) of the Emergency Department (ED)

The differences in sex structure of the examined patients were not statistically significant ($p = 0.79$), which can be seen even in Figure 2. The observed statistically significant difference in the age structure of the examined patients was the following: younger patients were most frequently examined in the ARI, while the older patients were mostly examined in the field ($p < 0.001$). The biggest number of patients examined in the ARI belonged to the age group of 20-49 and in the field to the age group of 60-89 (Figure 3).

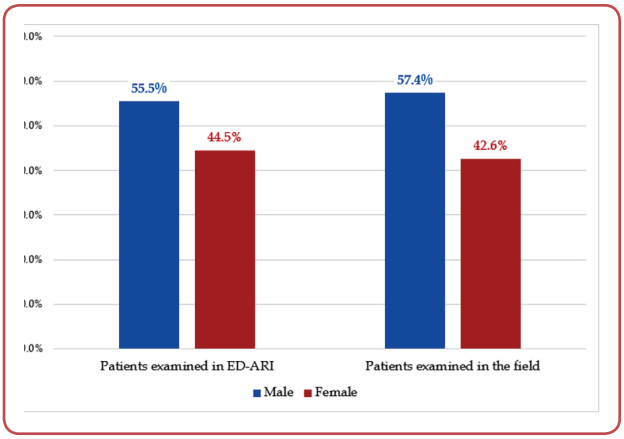

Figure 2: Sex distribution of patients examined in the Outptient Clinic for Acute Respiratory Infections (ARI) of the Emergency Department (ED) and in the field

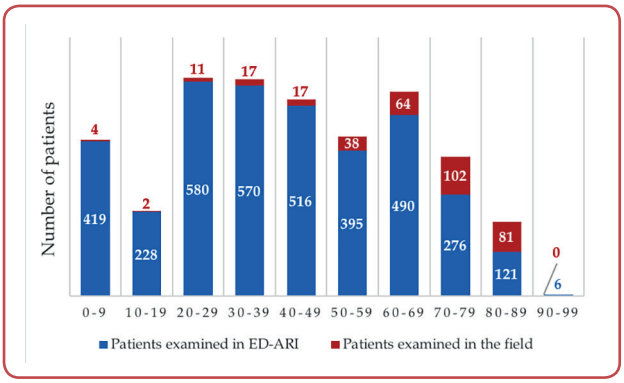

Figure 3: Age distribution of patients examined in the Outptient Clinic for Acute Respiratory Infections (ARI) of the Emergency Department (ED) and in the field

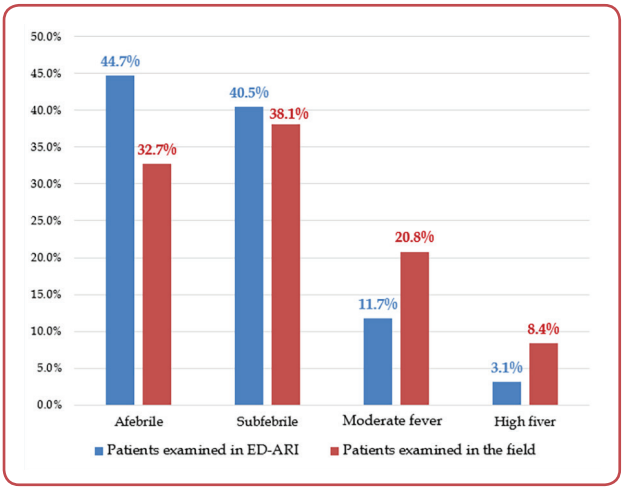

Figure 4: Body temperature of patients examined in the Outptient Clinic for Acute Respiratory Infections (ARI) of the Emergency Department (ED) and in the field

Raised body temperature was observed in 55.3 % patients examined in the ARI and 67.3 % patients in the field (Figure 4). There was statistically sigificant difference with regard to the raised body temperature between the patients examined in

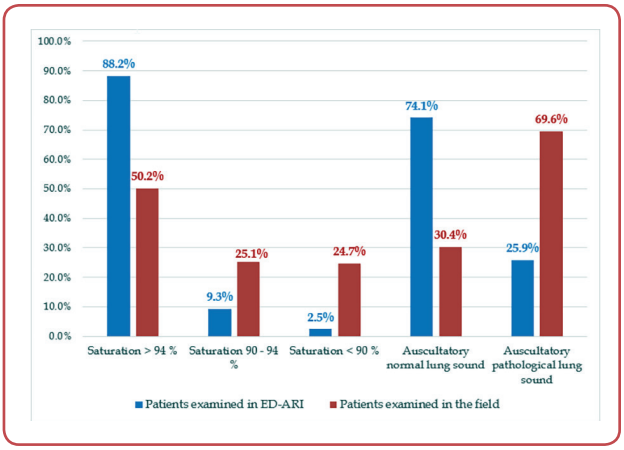

Figure 5: Saturation with oxygen (SpO_2) and auscultatory finding on the lungs of patients examined in the Outptient Clinic for Acute Respiratory Infections (ARI) of the Emergency Department (ED) and in the field

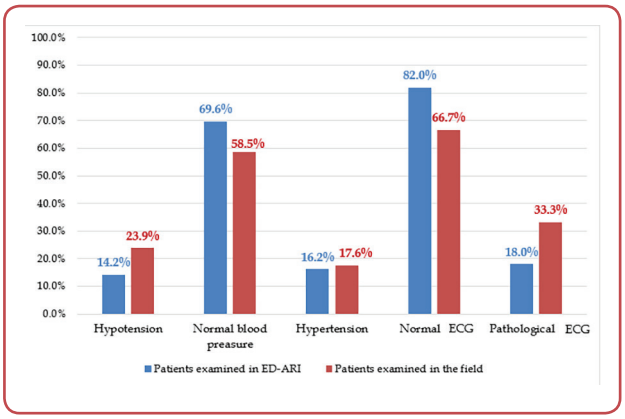

Figure 6: Values of blood pressure and ECG report of patients examined in the Outptient Clinic for Acute Respiratory Infections (ARI) and in the field

the ARI and patients in the field (p = 0.07). The patients examined in the field had significantly lower values of SpO_2 as compared with the patients examined in the ARI (p < 0.001), which can be seen in Figure 5.

Pathological auscultatory findings on lungs were seen statistically much more in patients in the field than in the ARI (p < 0.001), which can be seen in Figure 5. No statistically significant difference was observed in the values of blood pressure between the patiets examined in the ARI and in the field (p = 0.18). The values of blood pressure beyond the referential ones were measured with 30.4 % patients in the ARI and with 41.5 % patients in the field (Figure 6). Pathological ECG report was present in 18 % ECG reports performed in the ARI and in 33.3 % ECG reports performed in the field (Figure 6), where a statistically significant difference was noticed (p = 0.01).

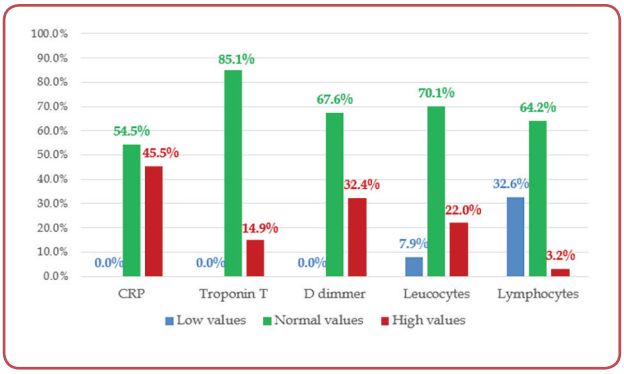

Figure 7: C reactive protein (CRP), Troponin T, D dimer, leucocytes and lymphocytes in the patients examined in the Outptient Clinic for Acute Respiratory Infections (ARI)

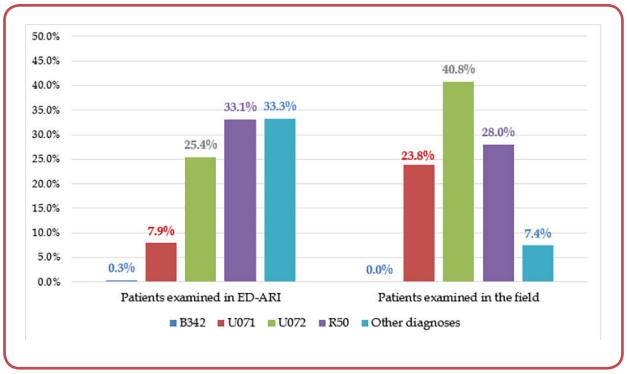

Figure 8: Overview of diagnoses of patients examined in the the Outptient Clinic for Acute Respiratory Infections (ARI) of the Emergency Department (ED) and in the field.
The International Classification of Diseases (ICD-10): B342: Coronavirus infection, unspecified; U071: COVID-19, virus identified; U072: COVID-19, virus unidentified; R50: Fever

Raised values of D-dimer were found with 32.4 % tested patients and raised values of troponin T were found with 14.9 % tested patients, which implied the indication for anticoagulant therapy. Raised values of CRP were found with 45.5 % tested patients (Figure 7). There were 7.9 % tested patients with leucopenia and 22 % tested patients had leucocytosis. There were 32.6 % tested patients with lymphocytopenia and 3.2 % tested patients had lymphocytosis.

Out of the total number of patients examined in the ARI, 7.9 % patients were examined under the diagnosis of COVID-19, virus identified (U07.1) (the International Classification of Diseases - ICD-10). and 25.4 % patients were examined under

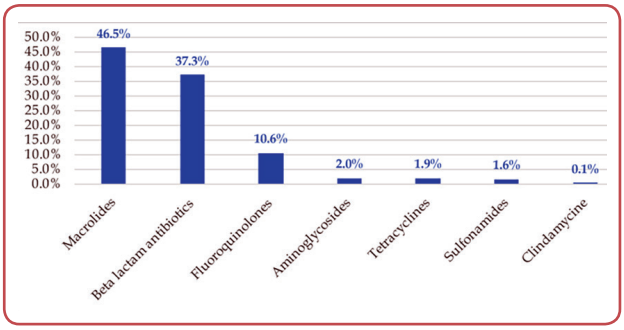

Figure 10: Overview of antibiotics prescribed in the Outptient Clinic for Acute Respiratory Infections (ARI) by the groups of antibiotics

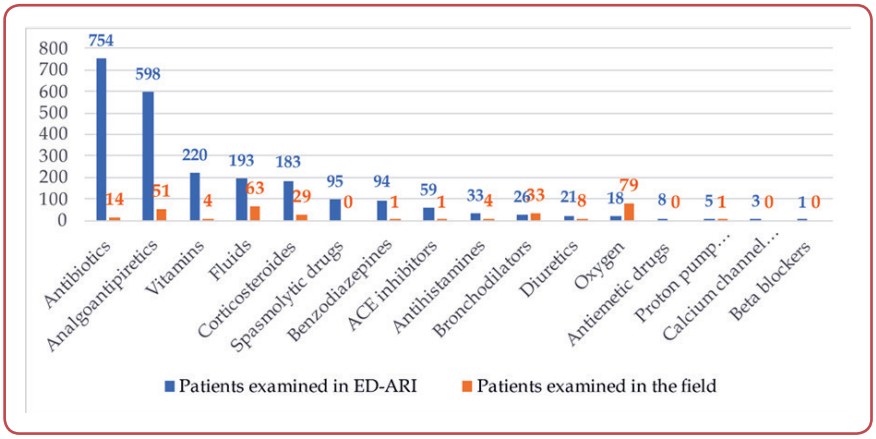

Figure 9: Overview of therapies administered in the Outptient Clinic for Acute Respiratory Infections (ARI) of the Emergency Department (ED) and in the field

the diagnosis of COVID-19, virus not identified (U 07.2). Out of the total number of examined patients examined in the field, 23.8 % patients were examined under the diagnosis of U 07.1 and 40.8 % patients were examined under the diagnosis of U 07.2 (Figure 8). There were 1,191 patients from the ED of the ARI and 258 patients examined in the field that were sent to the Clinic for Infectious Diseases of the University Clinical Centre Banja Luka for further diagnostic or hospitalisation.

The therapy administered in the ED of the Outpatient Clinic for Acute Respiratory Infections was most often antibiotic and analgesic or antipyretic drugs, while in the field it was most often oxygen, infusion and analgesic antipyretic therapy (Figure 9). Most frequently administered antibiotics were those from the group of macrolide and beta lactam antibiotics (Figure 10). The biggest number of patients in the field were taken care of based on the degree of urgency, out of who

mobile team I took care of 5.10 % vitally endangered patients by COVID-19, while mobile teams III (44.6 %) and IV (31.3 %) took care of the biggest number of patients with medium serious clinical features. One third of patients (33.3 %) had comorbidities in addition to diagnoses U 07.1, U 07.2 and Fever (R50). Out of the total number of children examined in the ARI (647), 259 children were sent for further dignostics or hospitalisation to the Clinic for Children's Diseases of the University Clinical Centre Banja Luka.

Discussion

COVID-19 in patients in this study was manifested in a different clinical picture and symptoms and the most frequent present symptoms were: raised temperature, fever, fatigue, dry cough, pains in bones and muscles, pneumonia followed by heavy breathing and shortness of breath,gastrointestinal symptoms (diarrhoea, nausea, vomiting), as well as losing sense of smell and taste. The number of COVID-19 infected patients had its peak in November 2020 as compared with other months. The number of those infected was 768 (19.51 %), which corresponds with the peak in November 2020 in our and in the neighbouring countries, like in Bosnia and Herzegovina (41,268 patients), in Serbia (128,484 patients), while the number of infected in the world increased from 45 million to 63 million people.[15] The biggest number of patients examined in the ARI belonged to the age group of 20-49 and in the field to the age group of 60-89, which corresponds with the overview of first 425 COVID-19 cases in Wuhan. Li et al showed that the median of the age of patients was 59, with the scope of 15-89,[16] just like it was in the sample of confirmed COVID-19 cases in the USA (age from ≥ 45 totalled 67 %), while in the Italian studies the average age of infected persons was 63.[17, 18] There were more male examined patients, which is in correlation with Li and associates.[16]

This study also analysed the clinical parameter of temperature and based on the data, raised temperature was present with 55.3 % patients (ARI) and 67.3 % patients (in the field), which was compared with the study in the sample of 1,099 patients from Wuhan where raised temperature was also present with 44 % patients at the time of reception, which is in accordance with data from this study.[19] our data, because in our sample there is no significant statistical difference.[19]

The parameter analysed was SpO_2 which was significant as the indicator for hospitalisation, since the lower values of SpO_2 (≤ 90 %) were connected with the more serious clinical picture. According to the USA National Institute of Health, optimal values of SpO_2 with infected patients were considered to be the values of 92-96 % in the ambient air.[20] Low values of SpO_2 were observed with 11.8 % patients in the ARI and 48.9 % patients in the field, which is the correlation with the pathological auscultatory findings on the lungs, which was present in 25.9 % patients in the ARI and 69.6 % patients in the field, so that there was a significant statistical difference between the ARI and the field.

In the research it was noticed that the values of blood pressure, beyond the reference values, did not have a significant statistical difference with regard to the patients in the ARI and those in the field. In the United States of America, the arterial hypertension was present as the accompanying diagnosis in 50 % cases,[21] which is significantly more compared with this data. Pathological ECG report showed significant statistical deviations in the field (33.3 %) compared with the ARI (18 %). Raised values of D-dimer were present with 32.4 % patients, while the raised values of troponin T were present with 14.9 % patients, which significantly influenced application of anticoagulant therapy or hospital treatment, which indicates acute damage of myocardium and thromboembolism of lungs. In the American study comprising 2,377 COVID-19 positive patients, raised value of D-dimer was present in 76 % and raised value of troponin T in 12 % cases.[22, 23] In the present study, the values of D-dimer were significantly lower, while the value of troponin T correlated with the American study.

Raised values of CRP were the indicator of acute inflammation with coronavirus and our data refer to the patients examined in the ARI, where it was possible to make laboratory diagnostics (45.5 %) and in the field it was not possible to determine CRP. According to the research conducted in China, 86 % patients had raised CRP, which is significantly more as compared with the results from this study, which we can explained with the deficiencies of the findings in the field.[24]

With regard to other laboratory findings, which were also done in the ARI and not in the field, the data obtained from the complete and differential blood count indicated the aetiology of virus dis-

ease with present leukopenia and lymphocytopenia, while a part of the patients had the signs of bacterial infection with leucocytosis. In the Chinese study, lymphocytopenia (83.2 %) and leukopenia (33.7 %) were also raised values, which corresponds with the present data.[25]

The patients with the confirmed COVID-19 diagnosis and patients suspect of COVID-19 had deteriorations and comorbidities particularly in the ARI, which made clinical picture more serious, prognosis more uncertain, so that the urgent treatment of the life-endangered patients with the signs of acute respiratory insufficiency required fast reaction and application of oxygen therapy, additional medicaments and diagnostics, as well as the need of hospitalisation.

In the ARI of the ED the most used therapy was the antibiotic one, while in the field it was the oxygen, infusion and analgoantipyretic therapy. The most frequently given antibiotics were the ones from the group of macrolide and beta lactam antibiotics and antiviral drugs were not applied, because they were not available. The data from the study Wang and associates indicate that the COVID-19 patients were most often treated with the combination of antiviral drugs (oseltamivir with 89.9 % patients) and antibiotics (moxifloxacin 64.4 %, ceftriaxone 24.6 % and azithromycin 18.1 %).[26]

Conclusion

During the epidemic of COVID-19, the work in the ED was reorganised in the improvised ARI, for the purpose of decresing the spread of the coronavirus epidemics. Triage and taking epidemiological overview when receiving the patients contributed to the decrease of potential sources of epidemics compared with the patients who were coming for other diagnoses. Because of frequent mutations of viruses and present non-specific and specific polymorph symptoms that indicated COVID-19, the complete diagnostics and treatment could not be implemented in the ED, but required sending to the hospital level. The significance of the ED was in an urgent treatment of the life-endangered patients in the first contact, in the ARI and in the field, then in the triage, examination, diagnostics and theraphy according to the seriousness of the clinical picture, as well as in the transportation of the patients requiring hospital treatment. Diagnostics of more serious clinical forms of disease and timely treatment of patients with cardiological and pulmonary symptomatology required doing laboratory analyses, determining CRP, Troponin T and D dimer, which was the chief indicator for the doctors in the ED in establishing diagnosis and justification for sending the patient for the hospital treatment.

Acknowledgements

None.

Conflict of interest

None.

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