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აღნიშნული სტატიის დაოფაზებულმა შეფასებით არ გამოვიყენებით.
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JUSTIFICATION OF THE COMPREHENSIVE PROGRAM OF PREVENTION OF HYPERTENSION DISEASE IN MEDICAL WORKERS
THE STUDY OF LIVER AND KIDNEY FUNCTION WITHIN COVID-19 PATIENTS

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Abstract.

Goal: The existing data on the coronavirus disease 2019 (COVID-19) revealed the impact of the disease on different organs such as the liver, the heart, the kidneys, etc. In our study, we evaluated the clinical characteristics of COVID-19 in patients with abnormal liver and kidney test results in recovered and dead patients.

Material and Methods: The number of the covid-19 patients was – 289. The gold standard method of polymerase chain reaction (PCR) was used to detect the infection of Covid-19. Blood plasma was used as research material. For The Determination of ALT, AST, and Creatinine, the Analyzer was the Prestige 24i - optimized, modified method according to the International Federation of Clinical Chemistry (IFCC), without pyridoxal phosphate; For the statistical analysis were used the Graphed Prism (Version 8.0).

Results: Studies have revealed an increase in AST and ALT compared with the reference value. A small difference was also found between those who died and those who recovered; A change in creatinine levels was also found. Men have a high level of Creatinine (~4.28 times) compared with the reference level, and in women, the level of Creatinine is ~2.18 times higher than the reference level.

Conclusion: We have thought that according to our results, the high creatinine levels may have some risk impact for the severity of COVID-19 disease.

Key words. Liver, Kidney, Covid 19.

Introduction.

The pandemic of COVID-19 caused by SARS-CoV-2 isn't unknown to anyone. It started when, back in 2019, the first case of the infection was reported from Wuhan, China, and rapidly spread in the whole world [1]. Initially known to cause only respiratory distress and illness, it has now been ascertained that the virus can affect any organ and lead to organ function derangement. It has been proposed that the virus binds to ACE-2 (Angiotensin Converting Enzyme-2) receptors which are found at higher levels in the lung tissue [2-4] but also in other organs as well. Several studies have indicated liver and kidney impairment due to SARS-CoV-2 infection [5,6]. Both cause injury to the liver and kidney, the virus itself, and the drugs used to treat severe infections [7,8]. The data from previous studies indicate that the liver enzymes' derangement corresponds with the infection's severity. As per a study by Huang and colleagues, an increase in AST was observed in 8 (62%) of 13 patients in the intensive care unit (ICU) compared with 7 (25%) of 28 patients who did not require care in the ICU [9]. Moreover, in a large cohort of 1099 patients from 552 hospitals in 31 provinces or provincial municipalities of China, more severe patients with disease had abnormal liver aminotransferase enzyme levels than did non-severe patients with the disease [10], several other studies have also shown CT changes in the liver and also on liver biopsy. The liver injury was more pronounced in patients having previously compromised liver and kidney function. Tsgeay et al. have also shown the level of liver and renal function biomarker abnormalities such as creatine kinase muscle-brain isoenzymes (CK-MB), troponin, AST, ALT, and Creatinine serum value was found to be elevated among ICU than non-ICU patients. in Ethiopia [11]. In this article, and we investigate the ALT, AST, and Creatinine within covid-19 patients.

Materials and methods.

The number of the covid-19 patients was – 289 (Adjara Population). The gold standard method of polymerase chain reaction (PCR) was used to detect the infection of Covid-19. In addition, a nasopharyngeal smear was used as research material. For The Determination of ALT, AST, and Creatinine used, the Analyzer was the Prestige 24i - optimized, modified method according to the International Federation of Clinical Chemistry (IFCC), without pyridoxal phosphate; The reference value for the Creatinine was 0.60~1.30 mg/dL; For the ALT and AST were <40 IU/L; For the statistical analysis were used the Graphed Prism (Version 8.0).

Results.

Liver damage in patients with coronavirus infection can be directly caused by a viral infection of liver cells. According to relevant studies, patients with ARVI confirmed the presence of the virus in the liver tissue. It should also be noted that infection with the Covid-19 virus significantly complicates the functioning of the liver, which is due to changes in these enzymes (ALT - alanine aminotransferase, AST - aspartate aminotransferase), which are usually 1-2 times higher than normal. Therefore, we also studied ALT and AST levels in patients infected with Covid-19. As the study results showed, the AST level in women is ~1.03 times higher than in men. AST is about 1.12 times more elevated in recovered men than in women. It should be noted that aspartate aminotransferase in deceased men is ~1.13 times higher than in dead women. In men, a high level of AST was found, ~ 10.8 times more compared to the reference indicator, and in women, it was increased ~ 5.8 times compared to the same reference indicator (Table 1) alanine aminotransferase (ALT). In men, ALT is increased by ~1.16 times compared to women. ALT in healthy men is about 1.03 times higher than in women. It should be noted that aspartate aminotransferase in deceased men is ~1.13 times higher than in dead women. In men, a high level of AST was found, ~ 10.8 times more compared to the reference indicator, and in women, it was increased ~ 5.8 times compared to the same reference indicator (Table 1) alanine aminotransferase (ALT). In men, ALT is increased by ~1.16 times compared to women. ALT in healthy men is about 1.03 times higher than in women. In deceased men, ALT is ~1.08 times higher than women's. In men, a high level of ALT was detected (~14.7 times and ~6.05 times) compared with the reference level. Women showed an increase in ALT levels by ~3.8 times compared with the reference level (Table 2).

Covid-19 infection is associated with increased mortality in people with kidney disease. In particular, after infection of the
lungs, infiltrating viruses enter the kidneys, accumulate, and cause significant damage to its cells. In addition to the above, the negative impact of Covid-19 infection on the kidneys also attracts attention. Concerning creatinine levels in the Covid-19 patients we studied, the results show that creatinine levels in men are ~1.3 times higher than in women. And in healthy women, the level of Creatinine is ~1.15 times higher than in men. The level of Creatinine in deceased men is and higher than in women. In men, a high level of Creatinine was detected in creatinine levels was also found. Men have a high level of Creatinine (~4.28 times) compared to the reference level, and in women, the level of Creatinine was ~2.18 times higher than the reference level (Table 3).

**Table 1. The study of AST in patients with Covid-19.**

<table>
<thead>
<tr>
<th>Study Population</th>
<th>The number of sample (n)</th>
<th>AST, Iu/L, (M±SD)</th>
<th>P value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Woman</td>
<td>n=138</td>
<td>48.93±28.06</td>
<td>0.7112</td>
</tr>
<tr>
<td>Man</td>
<td>n=117</td>
<td>47.62±28.09</td>
<td></td>
</tr>
<tr>
<td>Recovered man</td>
<td>n=98</td>
<td>43.16±19.63</td>
<td>0.7459</td>
</tr>
<tr>
<td>Died man</td>
<td>n=19</td>
<td>44.82±23.57</td>
<td></td>
</tr>
<tr>
<td>Recovered woman</td>
<td>n=124</td>
<td>43.34±19.69</td>
<td>0.122</td>
</tr>
<tr>
<td>Died woman</td>
<td>n=17</td>
<td>51.12±16.28</td>
<td></td>
</tr>
<tr>
<td>Recovered woman</td>
<td>n=123</td>
<td>43.56±19.28</td>
<td>0.1023</td>
</tr>
<tr>
<td>Recovered man</td>
<td>n=100</td>
<td>48.93±29.0</td>
<td></td>
</tr>
<tr>
<td>Died woman</td>
<td>n=21</td>
<td>72.62±51.43</td>
<td>0.6721</td>
</tr>
<tr>
<td>Died man</td>
<td>n=25</td>
<td>82.06±89.80</td>
<td></td>
</tr>
</tbody>
</table>

**Table 2. Study of ALT in patients with Covid-19.**

<table>
<thead>
<tr>
<th>Study Population</th>
<th>The number of sample (n)</th>
<th>ALT, Iu/L, (M±SD)</th>
<th>P value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Woman</td>
<td>n=143</td>
<td>45.73±25.22</td>
<td>0.0341</td>
</tr>
<tr>
<td>Man</td>
<td>n=122</td>
<td>53.22±32.02</td>
<td></td>
</tr>
<tr>
<td>Recovered man</td>
<td>n=91</td>
<td>51.39±27.30</td>
<td>0.0966</td>
</tr>
<tr>
<td>Died man</td>
<td>n=21</td>
<td>40.93±17.92</td>
<td></td>
</tr>
<tr>
<td>Recovered woman</td>
<td>n=127</td>
<td>44.53±22.60</td>
<td>0.3431</td>
</tr>
<tr>
<td>Died woman</td>
<td>n=18</td>
<td>39.22±18.38</td>
<td></td>
</tr>
<tr>
<td>Recovered woman</td>
<td>n=124</td>
<td>42.77±21.34</td>
<td>0.6072</td>
</tr>
<tr>
<td>Recovered man</td>
<td>n=96</td>
<td>44.25±21.01</td>
<td></td>
</tr>
<tr>
<td>Died woman</td>
<td>n=21</td>
<td>54.57±42.21</td>
<td>0.7452</td>
</tr>
<tr>
<td>Died man</td>
<td>n=25</td>
<td>59.10±50.29</td>
<td></td>
</tr>
</tbody>
</table>

**Table 3. The study of Creatinine in patients with Covid-19.**

<table>
<thead>
<tr>
<th>Study Population</th>
<th>The number of sample (n)</th>
<th>Creatinine, Iu/L, (M±SD)</th>
<th>P value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Woman</td>
<td>n=136</td>
<td>0.9147±0.2666</td>
<td>0.0001</td>
</tr>
<tr>
<td>Man</td>
<td>n=108</td>
<td>1.191±0.7111</td>
<td></td>
</tr>
<tr>
<td>Recovered man</td>
<td>n=89</td>
<td>1.205±0.7358</td>
<td>0.6482</td>
</tr>
<tr>
<td>Died man</td>
<td>n=19</td>
<td>1.123±0.5945</td>
<td></td>
</tr>
<tr>
<td>Recovered woman</td>
<td>n=125</td>
<td>1.497±0.721</td>
<td>0.9063</td>
</tr>
<tr>
<td>Died woman</td>
<td>n=18</td>
<td>1.309±0.7224</td>
<td></td>
</tr>
<tr>
<td>Recovered woman</td>
<td>n=125</td>
<td>1.385±0.5470</td>
<td>0.7584</td>
</tr>
<tr>
<td>Recovered man</td>
<td>n=89</td>
<td>1.205±0.7358</td>
<td></td>
</tr>
<tr>
<td>Died woman</td>
<td>n=17</td>
<td>1.342±0.7306</td>
<td>0.9794</td>
</tr>
<tr>
<td>Died man</td>
<td>n=24</td>
<td>1.350±0.9666</td>
<td></td>
</tr>
</tbody>
</table>

**Discussion.**

The increase in leukocytes is due to the high content of neutrophils with a significant increase in reduced enzymes (alanine aminotransferase and aspartate transferase). Also, with renal biomarkers (blood urea nitrogen, Creatinine) and coagulation parameters - MOF - a clear picture occurs in patients with severe disease, even with laboratory parameters that are first measured at admission [12]. According to the literature, COVID-19 links multiorgan failure, among them is liver damage [13]. In particular, It is confirmed that Abnormal liver function is common in patients hospitalized with coronavirus disease [14-16]. Sharme et al. suggested that acute liver injury and elevated liver enzymes are linked with COVID-19 disease severity. Increased levels of AST (p < 0.00001) and ALT (p < 0.00001) were revealed in covid-19 patients [17].

The studies suggest that The receptor of severe respiratory syndrome coronavirus 2 (SARS-CoV-2), is more distributed in the kidney compared to the lung tissue; therefore, it is supposed that the kidney might also be the target organ for the viruses [12,18,19]. Moreover, It is suggested that The distribution of kidney disease among patients with COVID-19 hospitalized kidney disease during hospitalization was associated with an increased risk of in-hospital death. It should be noted to increase their awareness of kidney disease in hospitalized patients with COVID-19. Early diagnostics of kidney conditions and involvement may reduce the severity and death of patients with COVID-19 [2,12,20,21]. The SARS-CoV-2 has some impact on the liver and kidney function in different pathways; therefore, the early monitoring of liver and kidney function may allow predicting the patient's condition, therefore, to reducing the mortality [20].

**Conclusion.**

Studies have revealed an increase in AST and ALT compared with the reference value. A small difference was also found between those who died and those who recovered; A change in creatinine levels was also found. Men have a high level of Creatinine (~4.28 times) compared to the reference level, and in women, the level of Creatinine is ~2.18 times higher than the reference level.

**Conflict of interest.** The authors declare no competing interests.

**REFERENCES**