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ASSOCIATION BETWEEN COMORBIDITIES AND DISEASE SEVERITY IN COVID-19 PATIENTS OF AN INFECTIOUS DISEASES HOSPITAL IN RUSSIA

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ABSTRACT — The aim of the study was to investigate the association between the severity of COVID-19 and various comorbidities in hospitalized patients. For this reason, patient histories of 500 patients who were hospitalized in the infectious disease hospital (Moscow, Russia) during the coronavirus pandemic were analyzed. The results showed that cardiovascular and blood diseases, diabetes mellitus, diseases of the central nervous system + psychiatric disorders, and diseases of the urogenital system were all found to be associated with a more severe disease course (X^2 = 44.404; p <0.001; X^2= 55.395; p <0.001; X^2= 19.974; p <0.001; X^2= 11.723; p =0.003, respectively), while diseases of the digestive system and liver (including viral hepatitis), HIV infection, and diseases of the respiratory system + ENT organs where not found to be associated with severity of COVID-19 (X^2= 6.949; p =0.031; X^2=1.582; p =0.453; X^2= 0.528; p =0.768, respectively). There was also found no association between pregnancy and severity of COVID-19 (X^2= 0.705; p =0.703). The authors concluded that persons who are known to have comorbidities should take extra precautions to avoid getting infected with SARS-COV-2 since they may be at a higher risk of having a severe disease course if they get sick.

KEYWORDS — COVID-19, SARS-COV-2, concomitant diseases, severe disease course, diabetes, cardiovascular diseases.

INTRODUCTION

Since it was declared a pandemic on the 11 of March 2020, SARS-COV-2 infection rapidly spread throughout the world in 223 countries and territories, infecting more than 90 million persons worldwide and caused almost 2 million deaths. [3, 6] To date, no effective treatment has been registered and vaccines are only now rolling out, mainly in Europe and North America. Initially it was not clear who would be most affected by the infection but as time went by studies showed that persons of older age had higher risks of severe illness with coronavirus infection, with the greatest risk of severe illness being among those aged 85 years of age and older. [4, 2] Other studies showed that having various comorbidities also affected the severity of COVID-19 in patients. These included comorbidities such as diabetes mellitus, respiratory disease, hypertension, chronic kidney disease and chronic liver diseases, cerebrovascular disease, cardiovascular diseases, and malignancy. [1, 5] It is important to have a good understanding of who the most at-risk populations are since this will allow public health officials to develop effective policies aimed at those populations. This in turn can play an instrumental role in preventing the spread of coronavirus to the populations at higher risk of severe illness.

Purpose of the study is to evaluate whether there is any association between the severity of COVID-19 infection and various comorbidities.

MATERIALS AND METHODS

Patient histories of 500 patients who were hospitalized with COVID-19 or suspicion of COVID-19 from March to August 2020 in the Infectious Diseases Hospital No. 2 (Moscow) were randomly selected from the hospital's archive. The required data was extracted from the patient histories including diagnosis, age, sex, duration of hospitalization, comorbidities, complications, disease course (clinical manifestations: mild, moderate, severe), and outcome. The data was then statistically processed and analyzed which included descriptive statistics and chi-square tests for independence. Microsoft Excel and IBM SPSS Statistics version 22 was used for statistical analysis of the data. The association was considered statistically significant at p<0.01.

RESULTS AND DISCUSSION

Out of 500 patients who were randomly selected from the hospital's archive, 432 were diagnosed with COVID-19. Those 432 coronavirus patients were then further studied. 193 (44.7%) of them were found to be males while females accounted for 239 (55.3%)

of those patients. The average age of the patients was 39 years (st. dev. 21.279; S.E. 1.025), at the same time the minimum and maximum ages were 1 month and 96 years, respectively. The average duration of hospitalization was found to be 12 days (st. dev. 8.733; S.E. 0.420).

Of the 432 patients with SARS-COV-2 infection, 10 (2.3%) were classified as having a mild clinical manifestation, 364 (84.3%) were classified as having a moderate clinical manifestation, and 58 (13.4%) were classified as having a severe clinical manifestation. In terms of comorbidities the results were the following: cardiovascular and blood diseases — 122 (28.2%) patients, diseases of the central nervous system and psychiatric disorders — 42(9.7%) patients, diseases of the digestive system and liver (including viral hepatitis) — 94 (21.8%) patients, diabetes mellitus — 38 (8.8%) patients, HIV infection — 40 (9.3%) patients, diseases of the urogenital system — 44 (10.2%) patients, diseases of the respiratory system and ENT organs — 41 (9.5%) patients, skin diseases — 21 (4,9%) and diseases of the endocrine system (excluding diabetes) — 10 (2.3%) patients. Among the coronavirus patients there were also 51 (11.8%) pregnant women.

When the relationship between cardiovascular and blood diseases, and severity of disease course was analyzed, the association between them was found to be statistically significant: X^2 (2, N = 432) = 44.404; p <0.001. This means that having cardiovascular and blood diseases was associated with a more severe disease course. Surprisingly, diseases of the central nervous system and psychiatric disorders were also found to have a statistically significant relationship with the severity of COVID-19: X^2 (2, N = 432) = 19.974; p <0.001. This means that among the studied coronavirus patients, diseases of the central nervous system and psychiatric disorders were associated with more severe clinical manifestations. Analysis of diseases of the digestive system and liver (including viral hepatitis) showed that there was no statistically significant relationship between them and severity of SARS-COV-2 infection: X^2 (2, N = 432) = 6.949; p =0.031. On the other hand, diabetes (type 1 and 2) was proved to have a statistically significant relationship with severity of disease course: X^2 (2, N = 432) = 55.395; p <0.001. Therefore, diabetes was associated with more severe clinical manifestations of COVID-19. Even though HIV infection is known to weaken the immune system, analysis of its relationship with severity of disease course surprisingly showed that they had no statistically significant relationship: X^2 (2, N = 432) = 1.582; p =0.453. Hence, for the 432 patients with SARS-COV-2 infection studied, having HIV infection was not associated with having more severe clinical manifestations. Another interesting finding is the relationship between diseases of the urogenital system and severity of disease course which was found to be statistically significant: X^2 (2, N = 432) = 11.723; p =0.003. Thus, having a disease of the urogenital system was associated with more severe clinical manifestations.

When the relationship between diseases of the respiratory system + ENT organs and severity of disease course was analyzed, there was found to be no statistically significant relationship between them: X^2 (2, N = 432) = 0.528; p =0.768. This means that unexpectedly, in the studied coronavirus patients, having comorbidities of the respiratory system + ENT organs was not associated with a more severe course of disease. However, when the chi square test was done using data of diseases on the respiratory system only (excluding diseases of ENT organs) more the 20% of the cells had a value of less than 5 which means that the test was invalid. Thus, a cohort consisting of a wider range of patients with diseases of the respiratory system is required in order the study their true association with severity of COVID-19 in patients. The same results were obtained for chi square tests performed when relationships were analyzed for diseases of the skin and diseases of the endocrine system (except diabetes).

An analysis of the relationship between pregnancy and severity of SARS-COV-2 infection showed that there was no statistically significant relationship between the two: X^2 (2, N = 432) = 0.705; p =0.703. Thus, pregnancy was not associated with more severe clinical manifestations of COVID-19.

CONCLUSION

Persons who are known to have comorbidities should take additional precautions to prevent themselves from becoming infected with SARS-COV-2 since certain comorbidities are found to be associated with more severe cases of COVID-19.

It must be noted that association does not mean causation, therefore some of the diseases that were found to be associated with a more severe disease course may not have caused that themselves but they in fact may be linked to another disease that did, or they may just happen to have had affected the patients studied by chance. To accurately assess the association between various comorbidities and severity of SARS-COV-2 infection a more controlled study must be undertaken where the patients being studied have only one comorbidity or several but related comorbidities (affecting one organ or organ system).

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