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A Retrospective Comparative Study of COVID–19 in Heart Failure Patients and its Correlation in the Length of Stay, the Risk for ICU Admissions, Intubation, Risk of Complications, and Mortality Rate Confined in King Khalid University Hospital

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Abstract
Background: *SARS–CoV–2 causes Coronavirus 19 (COVID–19). COVID–19 began in Wuhan, China, in December 2019. Through contaminated droplets, the disease spread quickly and became a global health concern. The World Health Organization labeled it a pandemic on March 11, 2020.*
Materials and Methods: *The study is a retrospective comparison because the data will come from COVID–19 patients who were admitted to King Khalid University Hospital from April 2020 to February 2022. Then, the people will be split into two groups: Patients in COVID–19 who had heart failure and patients who didn't have heart failure. Length of hospital stay, risk of ICU admissions, risk of complications, risk of intubation, death rate, and complications of the heart and lungs will all be written down so that they can be compared.*
Results: *The study compares COVID–19 individuals with and without heart failure for prevalence, characteristics, and outcome. COVID–19 has varied effects on cardiovascular and respiratory patients. In terms of ICU admissions, problems, intubations, and hospital stays, the Pearson correlation is –0.35 and significant at 0.583. Correlations of 0.133, 0.514, and –0.505 with significant values of 0.035, 0.000, and 0.000 are significant. COVID–19 heart failure patients have cardiovascular–related comorbidities. HTN is the most common comorbidity among COVID–19 patients with cardiovascular heart failure (148/59.2%). The DM follows with 110 or 44%. The DLP has 55 or 22% of the data. Rank of comorbidities in COVID–19 patients with heart failure associated to the respiratory system: rank COVID–19 patients with heart failure related to the respiratory system include CKD (11.6%) and Pneumonia (8.4%). ESRD had 19 cases, or 7.6% of the total. In terms of hospital length of stay, danger of ICU admissions, risk of complications, risk of intubation, mortality rate, and other cardiovascular and respiratory issues besides heart failure, the study found no significant difference between COVID–19 patients with and without heart failure.*
Conclusion: *The effects of COVID–19 on individuals with cardiovascular and pulmonary problems are significantly correlated. The COVID–19 patients with heart failure who have the highest comorbidity connected to the cardiovascular system is HTN, and the COVID–19 patients with heart failure who have the highest comorbidity connected to the respiratory system is CKD. The null hypotheses regarding clinical significances between COVID–19 patients with heart failure and those who do not have heart failure are all accepted.*

Introduction

The SARS–CoV–2 virus is the causative agent of Coronavirus disease 19 (COVID–19). COVID–19 originated in early December 2019 in Wuhan, China. The disease rapidly spread through contaminated droplets and eventually became a global public health crisis. On March 11, 2020, it was formally declared a pandemic by the World Health

Organization (WHO). The researcher wants to know the impact of COVID–19 on patients with cardiovascular and respiratory conditions. This research wants to identify the comorbidities present in King Khalid University Hospital COVID–19 patients with heart failure connected to the cardiovascular system and respiratory systems. The researcher also wants to know if there is a clinical significance between COVID–19 patients with and without heart failure based on the length of the stay in the hospital, the risk of ICU admissions, the risk of complications, the risk of intubation, the mortality rate, and other cardiovascular and respiratory complications beside heart failure.

Due to the pandemic, several individuals lost their lives. The main reason was not because of the disease, but it is the absence of knowledge and whereabouts of the disease. People in the field of medicine are focused on maintaining the health of patients who have clinical manifestations of a certain disease. Even the study is more in–depth with regards to cardiovascular and respiratory complications, which is why medical doctors will obtain more knowledge with regards to the relationship between COVID–19 and complications specific to the heart and lungs. Medical institutions, may it be well–known hospitals or community health centers, can base their action plans on COVID–19 patients with comorbidities since they can strategize on protocols that can aid these patients in recovery from COVID–19 and a better quality of life. Moreover, they can also improve their system in treating and prioritizing patients for a faster recovery and a reduced rate of bed occupancies. Finally, future researchers can benefit from this research due to the information that will require them to have a basis on. They may continue the said study by focusing more on the medical interventions, or they can focus more on the strategies and control for COVID–19 patients with comorbidities related to the cardiovascular or respiratory system.

Coronaviruses often thrive in bats, and these viruses are transmitted to intermediate animal hosts which may have caused humans to also acquire this classification of the virus. The beta coronavirus lineage is the one that has emerged in humans, starting from the 2003 severe acute respiratory syndrome (SARS) to the current COVID–19 which is caused by SARS–CoV–2. At first, COVID–19 was known for its pneumonia–like manifestation in patients, especially old–aged patients, and patients with specific comorbidities. With regards to transmission rate, COVID–19 tends to spread wider than the previous coronaviruses, yet despite its lower mortality rate, its rate is still higher than influenza[(1) (2)].

Angiotensin–converting enzyme 2 (ACE2) protein is one of the enzymes usually attached to the membrane surfaces of lung alveolar epithelial cells. However, as mentioned by Devaux et. al.[(1)], SARS–CoV–2 affects ACE2 by either impairing the structure of the enzyme or by downregulating the production of ACE2 protein, making room for the virus to invade the endothelial cells, replacing the positions that were supposedly for ACE2 proteins.

With the findings of Perico et. al[(3)], it was also reported that SARS–CoV–2 can also affect both the innate and adaptive immune response of a human body. For the innate, macrophages and neutrophils will be the ones that will release the response to eliminate the virus and infected cells. Pro–inflammatory cytokines increase within the lungs during the process, leading to recruiting more WBCs to remove the virus. The cytokines released will then become initiators for promoting adaptive immune response.

One of the manifestations present in COVID–19 patients is correlated with the cardiovascular system. As such, Goha et. al.[(4)] discussed how SARS–CoV–2 may cause primary or secondary damage to the heart. It was also mentioned how biomarkers of COVID–19 and cardiology are correlated, wherein increased levels of cardiac troponin, D–dimer, and BNP/NT– proBNP may cause heart–related conditions to arise in COVID–19 patients.

It was also determined that patients with already existing cardiovascular conditions are more prone to mortality due to COVID–19. The following were mentioned and briefly discussed— Acute cardiac injury, acute myocardial infarction (AMI),

myocarditis, arrhythmia, heart failure, cardiogenic or septic shocks, and homeostasis and thrombosis[4].

According to the American Heart Association, heart failure is the weakening of the heart due to a defect in pumping blood. As a chronic condition, the heart will at first try to compensate by enlarging the cardiac muscles. However, an increase in muscle mass and cardiac output will eventually weaken, which may then lead to one of the most fatal types of heart failure: Congestive heart failure[5]. One of the effects of COVID–19 is heart failure can cause fatality in patients. Dou This is due to the several implications involved, such as decreased immunity and hemodynamic ability to cope with severe infections. One of the possible causes of heart failure in COVID–19 patients is the direct systemic inflammation caused by SARS–CoV–2[6]. However, other researchers claimed several relations between heart failure and COVID–19. As previously mentioned, Dou et. al.[2] claimed that biomarkers related to the heart are increased which can cause heart failure. Moreover, it is also an end–stage manifestation of cardiovascular disease, which may have caused the long–term consequence of a cardiac infection due to SARS–CoV–2.

Lapid[7] provided an update regarding the health issue on COVID–19 patients who are seniors. It was also noted that increased risk of respiratory failure and high blood pressure can also be caused by COVID–19. Moreover, the CDC has also reported cough and shortness of breath as clinical manifestations of symptomatic patients of COVID–19[8].

The COVID–19 pandemic has affected several lives. Starting off as an epidemic, it became a pandemic in a span of months, as variants have also emerged. The main objective of the study is to find one or more variables that may affect COVID–19 patients due to the inadequate significance between heart failure and COVID–19 in King Khalid University Hospital, and the lack of clinical significance was based on the medical doctor who gave permission for the data of the hospital to be used for research purposes. With this, the patients will be divided into two groups: COVID–19 patients with heart failure and COVID– 19 patients without heart failure.

To reduce the bias in the study, researchers will be performing a simple random sampling and will verify whether the information on a patient is complete. The total number of COVID–19 patients in the locale is estimated to be 500, as the approximate number of participants for the two groups will be equally divided, which is 250 patients in each group. Frequency distribution tables and two–tailed hypothesis testing will be used for analyzing the data collated.

Aims and Objectives

The main objective of the study is to assess the prevalence, profile, and outcome of hospitalized patients with heart failure and coronavirus (COVID–19) and to compare the outcome between COVID–19 patients with and without heart failure.

Materials and Methods

The study is a retrospective comparative research, as the data retrieved will comprise COVID–19 patients admitted to King Khalid University Hospital from April 2020 to February 2022. The population will then be divided into two groups: COVID–19 patients with heart failure and COVID–19 patients without heart failure. The following will be recorded for comparison: Length of hospital stay, risk of ICU admissions, risk of complications, risk of intubation, mortality rate, and cardiovascular and respiratory complications.

The duration of the study will last approximately six months upon the approval of the research proposal. The population of the study will involve all patients aged 40–79 years old both males and females admitted at the King Khalid University Hospital starting from April 2020 to February 2022 who tested positive of COVID–19 through Real–Time Polymerase Chain Reaction (RT–PCR). Moreover, the subpopulation will comprise two groups: COVID–19 patients with heart failure and COVID–19 patients without heart failure.

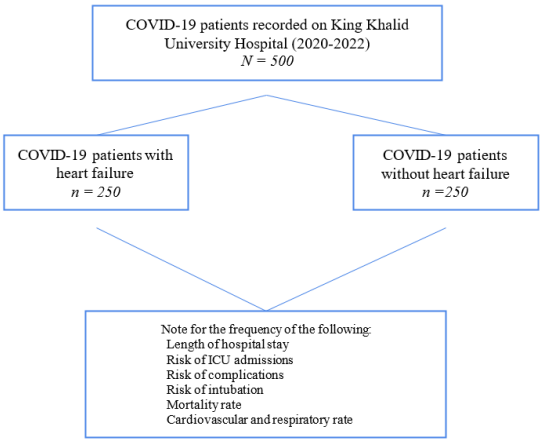

Figure 1. COVID Cases in the Hospital

The data retrieved will be based on the list of COVID–19 patients in King Khalid University Hospital in Riyadh, Saudi Arabia from April 2020 to February 2022. From the population, the sample size for each subgroup will be narrowed down by performing a simple random sampling. It is estimated that there will be 250 patients for each group. As for the ethical considerations, the researchers will abide by the World Medical Association's Declaration of Helsinki which consists of numerous ethical principles regarding medical research involving human participants and data. The research will be guided by the following sections from the declaration:

- Principle 12 in which that medical research involving human subjects must be conducted only by individuals with the appropriate ethics and scientific education, training, and qualifications. Research on patients or healthy volunteers requires the supervision of a competent and appropriately qualified physician or other health care professional.
- Principle 24 in which precaution must be taken to protect the privacy of each subject and the confidentiality of their personal information.
- Principle 25 regarding informed consent in which the participation of the individual or his/her representative such as family members should be voluntary.

The following are the criteria for the study: (1) Patients are diagnosed with COVID–19. (2) Information will only be extracted from the King Khalid University Hospital in Riyadh, Saudi Arabia from April 2020 to February 2022, and (3) Data gathered will only be focused on the presence or absence of heart failure, length of hospital stays, risk of ICU admissions, risk of complications, risk of intubation, mortality, and other cardiovascular complications and respiratory complications on both subgroups.

However, COVID–19 patients who are unregistered in the hospital will not be included. Moreover, data before April 2020 and after February 2022 will not be included in the study. When there is inadequate patient information required for the study, the data of the patient will not be included and will have to select by another patient through simple random sampling. In addition, the study will also exclude patients with congenital heart diseases, history of the acute respiratory syndrome, interstitial lung disease, and trauma patients.

The needed data for this study will be first obtained from the laboratory records of patients who tested positive for COVID–19 via RT–PCR. Furthermore, cardiovascular data such as the electrocardiogram will also be obtained from the patient laboratory reports for further analysis of data. All the other data sources required for the completion of the study were mentioned in detail under population, sample size, and the inclusion/exclusion criteria.

With regards to analyzing the data, the researchers will be using frequency distribution tables to represent the percentages of the length of hospital stay, risk of ICU admissions, risk of complications, risk of intubation, mortality, and other cardiovascular complications and respiratory complications on both subgroups. This information will also serve as the variables for the study.

Although it was noted by the medical doctor who disclosed the data that there was no significant difference between COVID–19 patients with heart failure and COVID–19 patients without heart failure, this does not determine whether there are significant differences between the two groups with regards to the data for every variable. With this, a two–tailed t–test will be used for each comparison of a variable to assess whether there is a significant difference between the two groups based on the independent variable. According to Statistics by Jim, a two–

tailed hypothesis testing aims to find a significant difference between two groups, disregarding whether the difference is increasing or decreasing[9].

Results

Table 1 Correlations of the parameters in determining the impact of COVID–19 on patients with cardiovascular and respiratory conditions

		IMPACT	HF_ICU_ADMISSION	HF_COMPLICATIONS	HF_INTUBATION	HF_LENGTH_OF_STAY
IMPACT	Pearson Correlation	1	-.035	-.059	-.004	-.007
	Sig. (2-tailed)		.583	.350	.949	.909
	N	250	250	250	250	250
HF_ICU_ADMISSION	Pearson Correlation	-.035	1	.133*	.514**	-.505**
	Sig. (2-tailed)	.583		.035	.000	.000
	N	250	250	250	250	250
HF_COMPLICATIONS	Pearson Correlation	-.059	.133*	1	.167**	-.246**
	Sig. (2-tailed)	.350	.035		.008	.000
	N	250	250	250	250	250
HF_INTUBATION	Pearson Correlation	-.004	.514**	.167**	1	-.580**
	Sig. (2-tailed)	.949	.000	.008		.000
	N	250	250	250	250	250
HF_LENGTH_OF_STAY	Pearson Correlation	-.007	-.505**	-.246**	-.580**	1
	Sig. (2-tailed)	.909	.000	.000	.000	
	N	250	250	250	250	250

*. Correlation is significant at the 0.05 level (2-tailed).
**. Correlation is significant at the 0.01 level (2-tailed).

The effect of the COVID–19 virus on patients with cardiovascular and respiratory conditions has resulted in different condition levels. Table 1 shows that there is a significant negative relationship between the impact of COVID–19 with patients having cardiovascular and respiratory conditions. It further displays that the Pearson correlation of –0.35 and significant value of 0.583, in terms of ICU admissions, complications, intubations, and length of stay in the hospital that there is a correlation. Garnering a correlation of 0.133, 0.514, and –0.505 with a significant value of 0.035, 0.000, and 0.000, respectively demonstrates a significant relationship.

The following are the comorbidities present in COVID–19 patients with heart failure connected to the cardiovascular system.

Table 2. Comorbidities present in the COVID–19 patients with heart failure connected to the cardiovascular system with their rank

CARDIO VASCULAR SYSTEM	FREQUENCY	PERCENTAGE	RANK
AFIB	35	14	4
CLABSI	2	0.8	11.5
DLP	55	22	**3**
DM	110	44	**2**
EF/UCF	3	1.2	9.5
HF	4	1.6	7.5
HTN	148	59.2	**1**
HYPO	3	1.2	9.5
IHD	31	12.4	5
NSTEMI	2	0.8	11.5
STROKE	15	6	6
OTHERS	4	1.6	7.5

Table 2 illustrates the comorbidities present in the COVID–19 patients with heart failure connected to the cardiovascular system with their rank. The highest comorbidity that is present in COVID–19 patients with heart failure related to the cardiovascular system is the HTN with a frequency count of 148 or 59.2% of the gathered data. It is followed by the DM with 110 or 44% of the record. The third is the DLP with a count of 55 or 22% in the data gathered and to be followed by the succeeding ranked comorbidities.

The following are the comorbidities present in COVID–19 patients with heart failure associated with the respiratory system.

Table 3. Comorbidities present in the COVID–19 patients with heart failure connected to the respiratory system with their rank.

RESPIRATORY SYSTEM	FREQUENCY	PERCENTAGE	RANK
CKD	29	11.6	**1**
PNEU	21	8.4	**2**
ESRD	19	7.6	**3**
BA	7	2.8	4
OTHERS	6	2.4	5
BRON	4	1.6	7.5
PE	4	1.6	7.5
PULMONARY	4	1.6	7.5
COPD	4	1.6	7.5
LUNG MASS	3	1.2	10
FLUID OVERLOAD	1	0.4	11

Table 3 demonstrates the comorbidities present in the COVID–19 patients with heart failure connected to the respiratory system based on their rank. The highest comorbidity that is present in COVID–19 patients with heart failure related to the respiratory system is CKD with a frequency count of 29 or 11.6% of the gathered data then followed by Pneumonia with 21 or 8.4% of the record. Next is the ESRD with a count of 19 or 7.6% in the data gathered and to be followed by the succeeding comorbidities with their corresponding rank.

The tables below show the Analysis of Variance table and the summary of the hypothesis test to determine if there is a clinical significance between COVID–19 patients with heart failure and without based on the length of stay in the hospital.

Table 4. ANOVA table of the COVID–19 patients with heart failure and without based on the length of stay in the hospital.

			Sum of Squares	df	Mean Square	F	Sig.
HF_LENGTH_OF_STAY * NHF_LENGTH	Between Groups	(Combined)	6.242	7	.892	.407	.897
		Linearity	.890	1	.890	.406	.524
		Deviation from Linearity	5.352	6	.892	.407	.874
	Within Groups		529.954	242	2.190		
	Total		536.196	249			

Table 5. Hypothesis test summary of the COVID–19 patients with heart failure and without based on the length of stay in the hospital.

Null Hypothesis	Test	Sig.	Decision
The distribution of HF_LENGTH_OF_STAY is the same across categories of NHF_LENGTH.	Independent-Samples Kruskal-Wallis Test	.834	Retain the null hypothesis.

Tables 4 and 5 describe the results of the COVID–19 patients with heart failure and without based on the length of stay in the hospital with an asymptotic significant value of 0.834 using the significant level of 0.05. Thus, there is no significant difference between the COVID–19 patients with heart failure and without based on the length of stay in the hospital.

Tables below present the Analysis of Variance table and the summary of the hypothesis test to determine if there is a clinical significance between COVID–19 patients with heart failure and without based on the risk of ICU admissions.

Table 6. ANOVA table of the COVID–19 patients with heart failure and without based on the risk of ICU admissions.

			Sum of Squares	df	Mean Square	F	Sig.
HF_ICU_ADMISSION * NHF_ICU	Between Groups	(Combined)	.366	2	.183	.896	.410
		Linearity	.065	1	.065	.317	.574
		Deviation from Linearity	.301	1	.301	1.475	.226
	Within Groups		50.470	247	.204		
	Total		50.836	249			

Table 7. Hypothesis test summary of the COVID–19 patients with heart failure and without based on the risk of ICU admissions.

Null Hypothesis	Test	Sig.	Decision
The distribution of HF_ICU_ADMISSION is the same across categories of NHF_ICU.	Independent-Samples Kruskal-Wallis Test	.408	Retain the null hypothesis.

Tables 6 and 7 describe the results of the COVID–19 patients with heart failure and without based on the risk of ICU admissions with an asymptotic significant value of 0.408 using the significant level of 0.05. That there is no significant difference between the COVID–19 patients with heart failure and without based on the risk of ICU admissions.

The tables below present the independent samples test and the summary of the hypothesis test to determine if there is a clinical significance between COVID–19 patients with heart failure and without based on the risk of complications.

Table 8. Independent samples test of the COVID–19 patients with heart failure and without based on the risk of complications.

		Equality of Variances		t-test for Equality of Means						
		F	Sig.	t	df	Sig. (2-tailed)	Mean Difference	Std. Error Difference	Interval of the Difference Lower	Interval of the Difference Upper
HF_COMPLICATIONS	Equal variances assumed	3.311	.070	.887	248	.376	.03824	.04311	-.04667	.12314
	Equal variances not assumed			.950	160.927	.344	.03824	.04026	-.04127	.11775

Table 9. Hypothesis test summary of the COVID–19 patients with heart failure and without based on the risk of complications.

Null Hypothesis	Test	Sig.	Decision
The distribution of HF_COMPLICATIONS is the same across categories of NHF_COMPLICATIONS.	Independent-Samples Kruskal-Wallis Test	.375	Retain the null hypothesis.

Tables 8 and 9 describe the results of the COVID–19 patients with heart failure and without based on the risk of complications with an asymptotic significant value of 0.375 using the significant level of 0.05. Thus, there is no significant difference between the COVID–19 patients with heart failure and without based on the risk of complications.

The tables below present the independent samples test and the summary of the hypothesis test to determine if there is a clinical significance between COVID–19 patients with heart failure and without based on the risk of intubation.

Table 10. Independent samples test of the COVID–19 patients with heart failure and without based on the risk of intubation.

		Equality of Variances		t-test for Equality of Means						
		F	Sig.	t	df	Sig. (2-tailed)	Mean Difference	Std. Error Difference	Interval of the Difference Lower	Interval of the Difference Upper
HF_INTUBATION	Equal variances assumed	3.505	.062	-1.063	248	.289	-.09290	.08738	-.26500	.07920
	Equal variances not assumed			-.925	23.978	.364	-.09290	.10047	-.30028	.11447

Table 11. Hypothesis test summary of the COVID–19 patients with heart failure and without based on the risk of intubation.

Null Hypothesis	Test	Sig.	Decision
The distribution of HF_INTUBATION is the same across categories of NHF_INTUBATION.	Independent-Samples Kruskal-Wallis Test	.288	Retain the null hypothesis.

Tables 10 and 11 describe the results of the COVID–19 patients with heart failure and without based on the risk of intubation with an asymptotic significant value of 0.288 using the significant level of 0.05. Thus, there is no significant difference between the COVID–19 patients with heart failure and without based on the risk of intubation.

The tables below present the independent samples test and the summary of the hypothesis test to determine if there is a clinical significance between COVID–19 patients with heart failure and without based on the mortality rate.

Table 12. Independent samples test of the COVID–19 patients with heart failure and without based on the mortality rate.

		Equality of Variances		t-test for Equality of Means						
		F	Sig.	t	df	Sig. (2-tailed)	Mean Difference	Std. Error Difference	Interval of the Lower	Interval of the Upper
HF_MORTALITY_RATE	Equal variances assumed	1.954	.163	.652	247	.515	.07407	.11361	-.14969	.29784
	Equal variances not assumed			4.158	242.000	.000	.07407	.01782	.03898	.10917

Table 13. Hypothesis test summary of the COVID–19 patients with heart failure and without based on the mortality rate.

Null Hypothesis	Test	Sig.	Decision
The distribution of HF_MORTALITY_RATE is the same across categories of NHF_MORTALITY.	Independent-Samples Kruskal-Wallis Test	.770	Retain the null hypothesis.

Tables 12 and 13 describe the results of the COVID–19 patients with heart failure and without based on the mortality rate with an asymptotic significant value of 0.770 using the significant level of 0.05. Thus, there is no significant difference between the COVID–19 patients with heart failure and without based on the risk of intubation.

Tables 4 to 13 appears the COVID–19 patients without heart failure in different cardiovascular and respiratory complications displayed their asymptotic significances of 0.834; 0.408; 0.375; 0.288; and 0.770, respectively at a 0.05 level of significance. Thus, there is no significant difference between the COVID–19 patients with heart failure and without based on the other cardiovascular and respiratory complications besides heart failure.

Discussion

The study centers on the assessment of the prevalence, profile, and outcome of hospitalized patients with heart failure and COVID–19 virus and the comparison of the results between COVID–19 patients with and without heart failure. The effect of the COVID–19 virus on patients with cardiovascular and respiratory conditions has resulted in different condition levels. It further displays that the Pearson correlation of –0.35 and significant value of 0.583, in terms of ICU admissions, complications, intubations, and length of stay in the hospital that there is a correlation. Garnering a correlation of 0.133, 0.514, and –0.505 with a significant value of 0.035, 0.000, and 0.000, respectively demonstrates a significant relationship. This conforms with the understanding of COVID-19, its diagnosis, prevention, and treatment that is rapidly developing, according to Madjid, et. al (2020) in their clinical review titled "Potential Effects of Coronaviruses on the Cardiovascular System." For the most recent recommendations, doctors are advised to visit the websites of their professional societies and the US Centers for Disease Control and Prevention. It would be prudent to determine the risk factors for the emergence of cardiac issues in COVID-19 patients as the disease develops and new information becomes available because there is a critical link between the effects of COVID-19 on patients with cardiovascular and respiratory diseases. On the other hand, the impact of COVID-19 on the cardiovascular system is examined in another clinical review by Soumya et al. (2021), titled "Impact of COVID-19 on the Cardiovascular System: A Review of Available Reports." It is discovered that people with pre-existing cardiovascular diseases (CVD) are more likely to contract COVID-19 infection, and that this infection has been linked to both direct and indirect complications such as myocarditis, acute

myocardial injury, venous through the several cardiovascular problems that might result from COVID-19 infection are listed in this article along with the mechanisms causing them. There are comorbidities present in the COVID–19 patients with heart failure connected to the cardiovascular system with their rank. The highest comorbidity that is present in COVID–19 patients with heart failure related to the cardiovascular system is the HTN with a frequency count of 148 or 59.2% of the gathered data. It is followed by the DM with 110 or 44% of the record. The third is the DLP with a count of 55 or 22% in the data gathered. On the other hand, comorbidities present in the COVID–19 patients with heart failure connected to the respiratory system based on their rank are as follows: rank 1 comorbidity that is present in the COVID–19 patients with heart failure related to the respiratory system is the CKD with a frequency count of 29 or 11.6% of the gathered data then followed by the Pneumonia with 21 or 8.4% of the record. Next is the ESRD with a count of 19 or 7.6% in the data gathered. This follows the article in WebMD entitled: Coronavirus and High Blood Pressure: What's the Link? Says that if you have high blood pressure, it's a good idea to take extra care to protect yourself during the coronavirus (COVID-19) outbreak. It is possible that having high blood pressure increases your risk of developing a serious illness and passing away from COVID-19. High blood pressure is the most prevalent pre-existing disease among hospitalized patients, impacting between 30% and 50% of the patients, according to an analysis of early data from both China and the U.S. Cancer, diabetes, and lung illness were some of the additional medical issues. According to a survey from Italy, more than 99% of those who died from the virus had one of these diseases, with high blood pressure being present in 76% of cases. According to additional study, patients with high blood pressure are more likely to develop severe COVID sickness and pass away. However, according to emerging research, coronavirus disease 2019 (COVID-19) increases the risk of cardiovascular events and that some of the disease's symptoms may interact with pre-existing cardiovascular risk factors in CKD patients. This research was published in the article COVID-19 in Chronic Kidney Disease: The Impact of Old and Novel Cardiovascular Risk Factors by S. Karger AG Basel (2021).

Lastly, it is presented in the study that there is no significant difference between COVID–19 patients with heart failure and without heart failure in terms of the length of stay in the hospital, risk of ICU admissions, risk of complications, risk of intubation, mortality rate and other cardiovascular and respiratory complications besides heart failure.

Conclusion

Based on the findings, the following conclusions were derived: (1) that there is a significant relationship between the impact of COVID-19 on patients with cardiovascular and respiratory conditions; (2) that the highest comorbidity that is present in the COVID-19 patients with heart failure related to the cardiovascular system is the HTN and the comorbidity that is highest in the COVID-19 patients with heart failure connected to the respiratory system is the CKD; and (3) the null hypotheses in clinical significances between COVID-19 patients with heart failure and without heart failure are all accepted.

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