Clinical Features & Outcomes of Hospitalized Patients with Covid-19 in Dhaka: A Single-Centered Cross-Sectional Descriptive Study.

By

KM RASHIDUL ISLAM SAKIB
ID-19376005

A thesis submitted to the Department of Mathematics and Natural Sciences in partial fulfillment of the requirements for the degree of
M.Sc in Biotechnology

Department of Mathematics and Natural Sciences
Brac University
July, 2023

Declaration

It is hereby declared that

1. The thesis submitted is my/our original work while completing my degree at Brac University.
2. The thesis does not contain material previously published or written by a third party, except where this is appropriately cited through full and accurate referencing.
3. The thesis does not contain material that has been accepted, or submitted, for any other degree or diploma at a university or other institution.
4. I have acknowledged all main sources of help.

Student's Full Name & Signature:

KM RASHIDUL ISLAM SAKIB

ID- 19376005

Approval

The thesis titled "Clinical Features & Outcomes of Hospitalized Patients with Covid-19 in Dhaka: A Single-Centered Cross-Sectional Descriptive Study." submitted by -

KM Rashidul Islam Sakib (ID- 19376005) of Summer 2023, has been accepted as satisfactory in partial fulfillment of the requirement for the degree of MS in Biotechnology on [13-07-2023].

Examining Committee:

Supervisor:
(Member)

_____
Fahim Kabir Monjurul Haque, PhD
Associate Professor
Department of Mathematics and Natural Sciences
Brac University

Program Director:
(Member)

_____
Munima Haque, PhD
Associate Professor
Department of Mathematics and Natural Sciences
Brac University

External Expert Examiner:
(Member)

_____
Dr. Muntasir Alam
Assistant Scientist, Emerging Infections
Infectious Diseases Division
icddr,b

_____
A F M Yusuf Haider, PhD
Professor
Department of Mathematics and Natural Sciences
Brac University

Departmental Head:
(Chair)

Ethics Statement

The study strictly maintained the principles and guidelines of the Helsinki declarations. Ethical clearance was obtained from the departmental review board of BRAC University, Dhaka, Bangladesh. Informed consent was obtained from the respondents before data collection. During data collection, the privacy of the respondents and confidentiality of the data was maintained strictly.

Abstract

Severe acute respiratory syndrome coronavirus-2 (SARS-CoV-2) is still currently a significant public health concern since the outbreak of its pandemic. we aim to share the clinical manifestations of 222 hospitalized COVID-19 patients and their outcomes. This cross-sectional descriptive study is based on clinical records that included patients diagnosed with COVID-19 in Z H Sikder Women's Medical College & Hospital between December 2020 to August 2021. In total 222 (136 male and 86 female) patients with COVID-19 PCR-positive tests were included in the study. The average age of the study group is 54.81. The most common symptoms were identified as fever (27.2%), cough (22%), sore throat (10.4%), body aches (16.8%), breathlessness (14.5%), diarrhea (2%), and headache (7.1%). Among the patients, 93(41.9%) people needed ICU support during treatment. The most common comorbidities were hypertension (48.3%), chronic kidney disease (8%), diabetes (33.9%), cardiovascular disease (3.8%), and chronic obstructive pulmonary disease (5.9%). The elevated rate had been observed on different biochemical tests such as SGPT [U/L] (mean-45.12), S. Creatinine[mg/dl] (mean-1.5), CRP [mg/l] (mean-84.53), D-dimer [μg/ml] (mean-232.35), S. Ferritin [ng/ml] (mean-502.24). Of 222 patients, 63(28.4%) patients died during treatment and 159(71.6%) were recovered and discharged from the hospital after declaring negative on PCR test for COVID-19. Patients who died typically had preexisting conditions and severe perturbations in inflammatory markers and intensive care requirements.

Keywords: Covid- 19; Fever; Hypertension; D-dimer; CRP

Acknowledgment

I am deeply grateful to my supervisor, Dr. Fahim Kabir Monjurul Haque for his unwavering support and guidance throughout the whole work. His expertise and patience had been invaluable to me and have played a crucial role in the success of this thesis. I found him very much responsive even after his busy schedule, whenever I was in need of any instructions or review of my progress during work he always responded immediately and guided me.

I am grateful to ZH Sikder Women's Medical College & hospital authority for providing me with the opportunity to conduct my research and for all of the resources and support they provided.

I am deeply thankful to my friends and family for their love and support during this process. Especially, my wife who helped me in my writing work late at night even after being pregnant. She influenced me to remain consistent in my thesis work. without their encouragement and motivation, I would not have been able to complete this journey.

I am thankful to everyone who supported me throughout this process. Without their help and guidance, this thesis would not have been possible.

Contents

List of Tables

List of Figures

List of Acronyms

TERM	ABBREVIATION
ACE-2	Angiotensin-Converting Enzyme 2
ARDS	Acute Respiratory Distress Syndrome
AST	Aspartate Transferase
BP	Blood pressure
CDC	Centers for Disease Control and Prevention
CKD	Chronic kidney Disease
COPD	Chronic obstructive pulmonary disease
COVID-19	Coronavirus Disease 2019
CRP	C-reactive protein
CVD	Cardiovascular Disease
ICU	Intensive care unit
IEDCR	Institute of Epidemiology, Disease Control and Research
MIS-DGHS	Management Information System - Directorate General of Health Services
OR	Odds ratio
REF	Reference
RT-PCR	Reverse Transcription Polymerase Chain Reaction
SARS-COV-2	Severe Acute Respiratory Syndrome Coronavirus -2
SD	Standard Deviation
SGPT	Serum Glutamic Pyruvic Transaminase.

SpO2   Oxygen Saturation

SPSS   Statistical Package for the Social Sciences
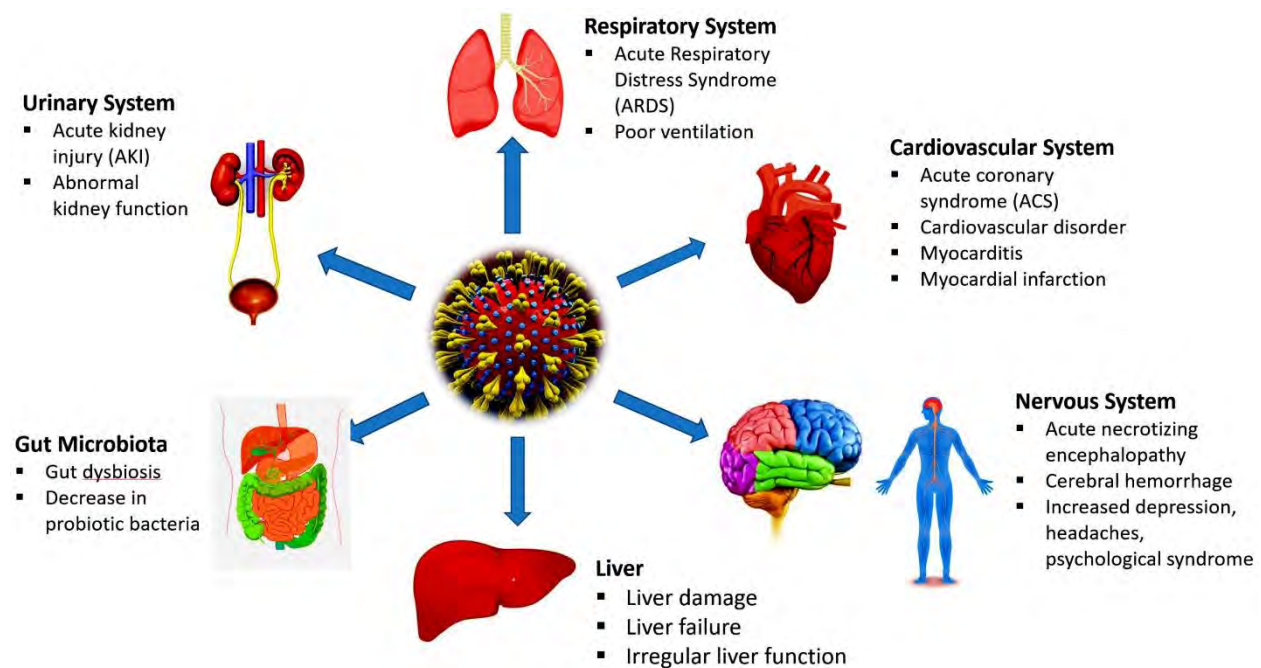
WHO   World Health Organization

Chapter 1

Introduction

Coronaviruses have been causing significant disease outbreaks globally over the past two decades. In 2002, severe acute respiratory syndrome (SARS) had appeared in east Asia (Cherry et al., 2004) and afterwards the Middle east respiratory syndrome (MERS) caused an outbreak in the Middle East in 2012 (Milne et al., 2014). Now the new coronavirus disease 2019 pandemic had been initiated in late December 2019 and the causative agent was severe acute respiratory syndrome coronavirus 2 (SARS-CoV-2) which was first found in China and then spread worldwide (H. Zhu et al.,2020). After appearing in Wuhan, the virus was transmitted worldwide through the human

that served as a host for the virus. Due to the rapidly spreading nature of the virus on a global scale World health organization had announced a public health Emergency of international concern on January 31, 2020 (WHO). Later on, March 11, 2020 declared the situation as pandemic. From the beginning to 3 May 2023, there have been 765,222,932 confirmed cases of COVID-19, including 6,921,614 deaths (WHO). In Bangladesh the first case was identified on 8th March 2020. In Bangladesh, from 3 January 2020 to 3 May 2023, there have been 2,038,250 confirmed cases of COVID-19 with 29,446 deaths have occurred (WHO-COVID-19 Dashboard,2023). The first strike of the pandemic hit on Bangladesh mainly in May-2020 when the infection rate was 12% and was gradually increasing and reached over highest 32% in the mid-august, then gradually decreased and it took mid-December to get a 9% infection rate (MIS-DGHS & IEDCR). That was the first wave and similarly, earlier in March 2021 the second wave of COVID-19 had stricken and late-July 2021 the infection rate was highest at 33% and it took October 2021 to come down to 6% (MIS-DGHS & IEDCR). And consequently, on January 2022 the third wave had generated and the highest infection rate was 32% by then which took March 2022 to get down below 5%. (MIS-DGHS & IEDCR). Initially,

Patients came with a wide range of symptoms like cough, shortness of breath, fever, chills, muscle pain, headache, sore throat, and loss of smell and taste and interestingly most of the patients remain asymptomatic while the symptoms vary person to person (Carfi et al.,2020; CDC,2020a). Several data reported that COVID-19 should be considered as a multisystem disease in which patients can present with chest tightness and palpitations instead of cough and other respiratory symptoms (Wang et al.,2020).

In addition, conditions like acute respiratory distress syndrome (ARDS), Septic shock, acute kidney injury, cardiac injury, pulmonary failure, and multi-organ failure have been reported as COVID-19 infection complications (WHO). A study was conducted regarding the effects of COVID-19 in different parts of human body (Figure-1) (Chowdhury et al., 2021).

Reference-https://microbiologyjournal.org/harmful-effects-of-covid-19-on-major-human-body-organs-a-review

Figure 1 : Effect of COVID-19 in major parts of human body.

The hospital-admitted patients showed varieties of clinical manifestations ranging from asymptomatic forms to severe Pneumonia which will lead to respiratory failure, sepsis, and septic shock (Huang C et al., 2020). In terms of different risk factors regarding COVID-19 disease advanced age, immunodeficiency, diabetes, hypertension, cardiovascular disease, and

chronic lung disease have been identified according to the Centers for disease control and Prevention (2021). Since after developing the infection of the host the virus exploits the immune system of the host in a very rapid time and this is why immunological parameters in human biochemical test appeared on elevated state. It was found that lymphopenia was the prevalent hematological findings in many patients (Chen x et al.,2019). Additionally high CRP, Serum ferritin, lactate dehydrogenase, D-dimer, Prothrombin time found beyond normal range and these increase the risk of Covid-19 associated conditions and deaths (Young BE et al., 2020). Besides the risk of ARDS is also being facilitated by higher D-dimer and prothrombin time (Yang x et al.,2020). Patients those came under medical facility for treatment During the pandemic wave periods in Bangladesh, the clinical facility named Z H Sikder Women's Medical College & Hospital provided support towards the health hazard, and from December 2020 to September 2021 those admitted patients had been served. Their mortality rate was 28.4%. In this study, we took those patients' medical records from the hospital. The data set is composed of the patient's demography, signs and symptoms, vital clinical signs, selective laboratory test results, and the outcomes of the patients.

1.1 Objectives

The objective of this descriptive cross-sectional study was to understand the prognosis of COVID-19, which will mostly focus on patient's symptoms, different vital signs, biochemical test etc. We aim to assess the disease dynamics of COVID-19 infection by observing patients' clinical features and outcomes and we expect this will add some value towards the further research and analysis regarding COVID-19 disease prognosis, disease treatment, and comprehensive management of outcomes.

Chapter 2

Materials and methods

2.1 Study design and population

This single-centered, cross-sectional and descriptive study included patients diagnosed with Confirmed COVID-19 RT-PCR test positive. The study was conducted from the data of patients between July 2020 to September 2021 and carried out at ZH Sikder Women's medical college and Hospital, Dhaka. The study population was all hospital-admitted patients in the hospital and the sample size was 222 in number.

2.2 Sampling technique and data collection

All the patients' data were collected from patient's medical records and Hospital diagnostic management software where data was stored. The data set contains the following variables: Sociodemographic characteristics, Vital Signs, Comorbidities, Clinical manifestations, length of stay, admission area, in hospital complications, in-hospital outcomes, and laboratory investigations including C-reactive protein (CRP), serum glutamate pyruvate transaminase (SGPT), Creatinine, D-dimer, ferritin.

2.3 Statistical Analysis

Data management was performed using the SPSS package program. While the continuous variables were provided as mean ± standard deviation and the categorical variables were presented as numbers and percentages. The independent sample t-test was performed to test the mean difference between different continuous variables using the dichotomous variables categories.

Chapter 3

Results

A total of 222 cases were reached in this study and no exclusion was required for the data set.

3.1 Patient's Sociodemographic and disposition data

During the COVID-19 pandemic wave in Bangladesh the COVID-19 test-positive patients those required hospital care had come to ZH Sikder Women's medical college & Hospital, Dhaka, and got admitted. Among the 222 admitted patients 136 (61.3%) were male and 86(38.7%) were female. The overall age ranged from 11 to 86 years old with a median age of 57 years. The mean age of the patients was 54.81 ± 16.73 years.
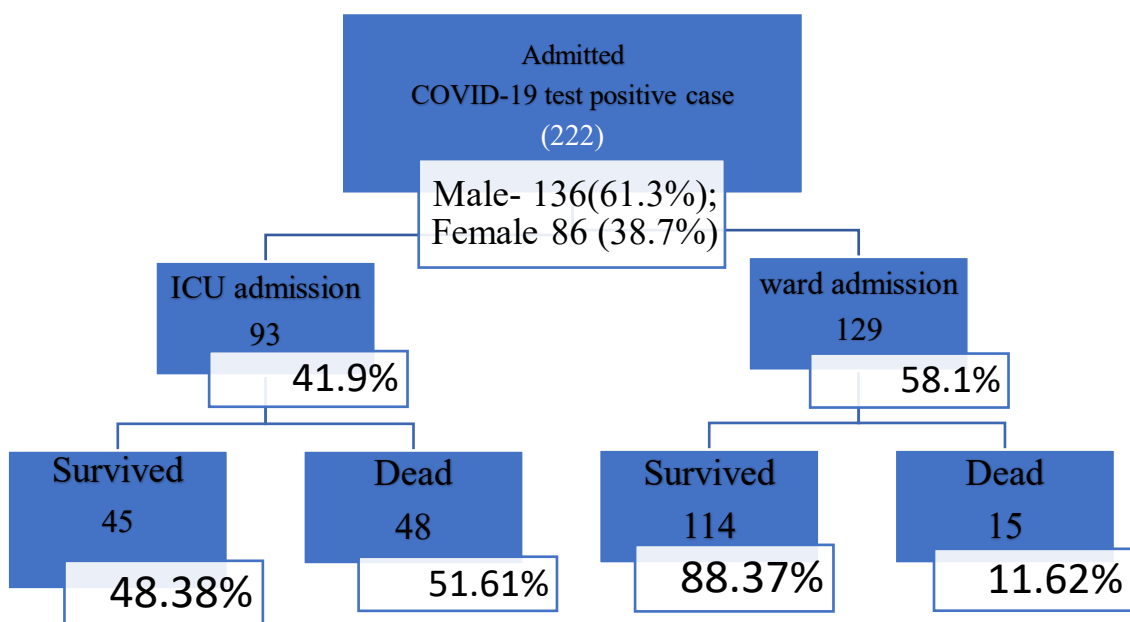
Figure 2: Patient's flow

Of 222 patients 129 (58.1%) were initially admitted into the ward whereas 93 (41.9%) patients were admitted directly to the Intensive care unit (ICU) of the hospital. Overall, 159 (71.6%) patients were discharged from the hospital, while 63 (28.4%) died during their treatment period in the hospital (Figure -2).

Reasons for ICU admission that appeared in the initial stage included respiratory distress (82%), transfer from another hospital due to lack of ventilation support (7%), decreased level of consciousness (3%), and cardiac and respiratory arrest (8%).

3.2 Comorbidities

Hypertension and diabetes were the most commonly recorded comorbidities, Where 138 (48.30%) and 97(33.9%) respectively among the patients (Figure-3).
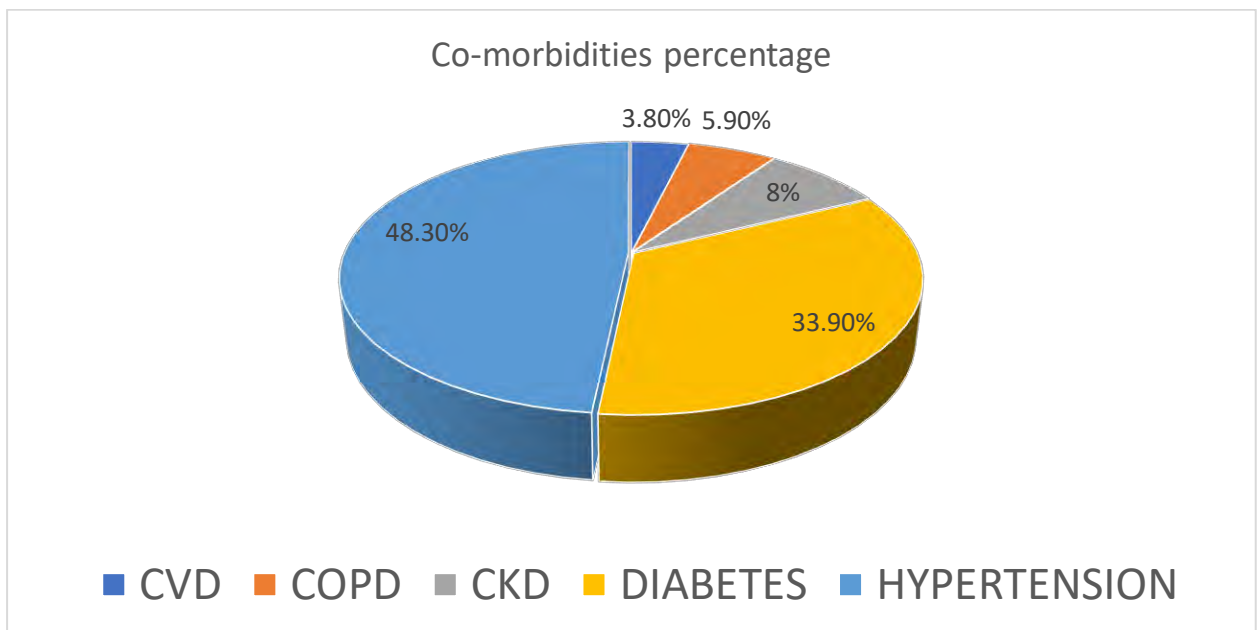
Figure 3 : Co morbidities distribution among patients.

It had been seen that males are more predominant in terms of having comorbidities like hypertension (male -57.2%, female- 42.8%), cardiovascular disease (male-63.6%; female-36.4%), and diabetes (male-57.7%; female-42.3%) chronic kidney disease (male- 52.2%; female-47.8%) than females. Females are more predominant in terms of chronic obstructive pulmonary disease (male- 29.4%; female 70.6%) than males (Figure-4).
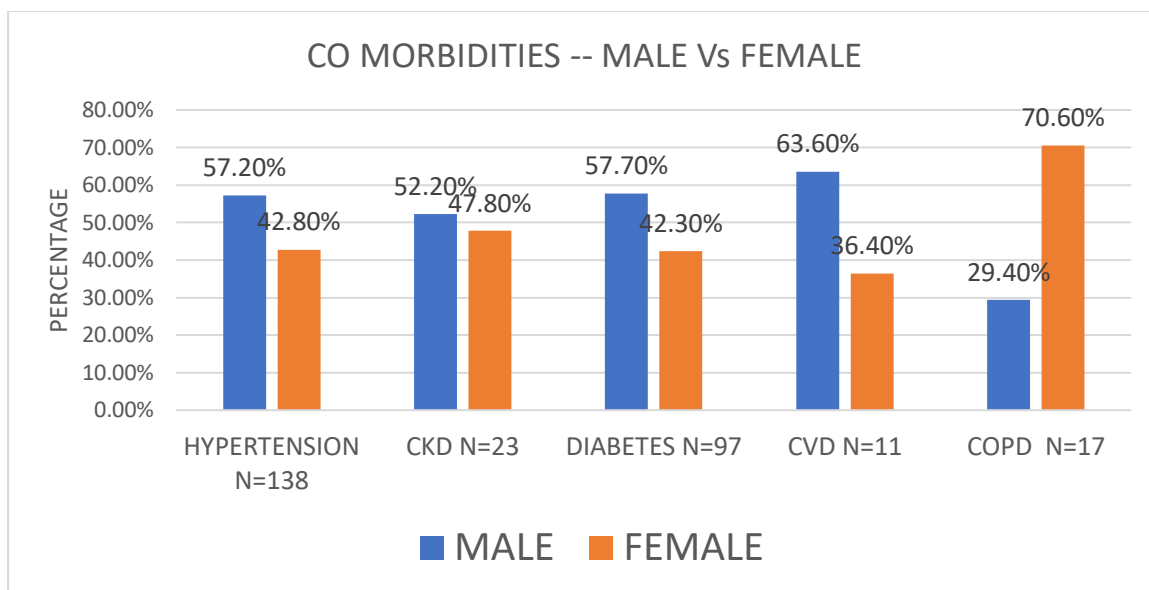
Figure 4; Comorbidities among Male & Female

3.3 Vital signs of patient's prior admission & study definitions

Before admission of the arrived patients, several vital signs parameters were checked to assess the basic body functions. Variables are followed by pulse rate, blood pressure, oxygen saturation in blood, and body temperature.

Table 1; Vital clinical signs statistics of patient's prior admission.

Clinical Parameter	**Mean±Sd**	**Min**	**Max**
Pulse(bpm)	91.86±16.41	55	164
BP(Systolic)	123.41±18.045	50	177
BP(Diastolic)	73.94±11.693	30	100
Spo2(%)	91.81±9.259	33	100
Temp(F)	99.22±1.774	96	105

Here the pulse rate is a measurement of the heart rate or the number of times the heart beats per minute, a pulse not only measures the heart rate but also can indicate the Heart rhythm and Strength of the pulse. The normal pulse for healthy adult ranges from 60 to 100 beats per minute. (Johns Hopkins Health System). From our study, we have got the Pulse rate is higher among patients. The mean is 91.86 for pulse rate (Table -1).

Blood pressure is the force of the blood pushing against the artery walls during contraction and relaxation of the heart. High blood pressure, or hypertension, directly increases the risk of heart attack, heart failure, and stroke. Blood pressure is categorized as normal, elevated, or stage 1 or stage 2 high blood pressure. (Johns Hopkins Health System). our study found the admitted patients' blood pressure was within the normal state (Table-1).

Blood oxygen level is a measure of how much oxygen your red blood cells are carrying. A reading indicates what percentage of your blood is saturated, known as the SpO2 level. A normal level of oxygen is usually 95% or higher. A below-normal blood oxygen level is called hypoxemia. Hypoxemia is often a cause for concern. The lower the oxygen level, the more severe the hypoxemia. This can lead to complications in body tissue and organs. (Brant et al., 2022) This is why in terms of COVID-19 patients it's a major indicator for the patients to look for. Our study suggests that a major portion of patients were in hypoxemia condition before admission and the mean score was 91.81 % in terms of oxygen saturation in the blood (Table-1).

Normal body temperature can range from 97.8 degrees F (or Fahrenheit, equivalent to 36.5 degrees C, or Celsius) to 99 degrees F (37.2 degrees C) for a healthy adult. A fever is indicated when body temperature rises about one degree or more over the normal temperature of 98.6 degrees. (Johns Hopkins Health System). In our study, we have figured out that, fever was present in each individual, and the highest temperature was recorded at 105 º C (Table-1).

3.4 In-hospital Characteristics of patients

Fever was the most frequent clinical feature among patients (n= 220,27.2%) and a large portion had a cough (n= 178,22.0%). Another leading complaint had been found was body aches or pain (n= 136,16.8%). Difficulty in breathing or breathlessness was another symptom observed among patients which were (n= 117,14.5%). Patients also complained about sore throat (n=84,10.4%). Headache was presented in a certain amount of people (n= 57,7.1%) and diarrhea was within a small group of people (n=16,2.0%) (Figure-5).
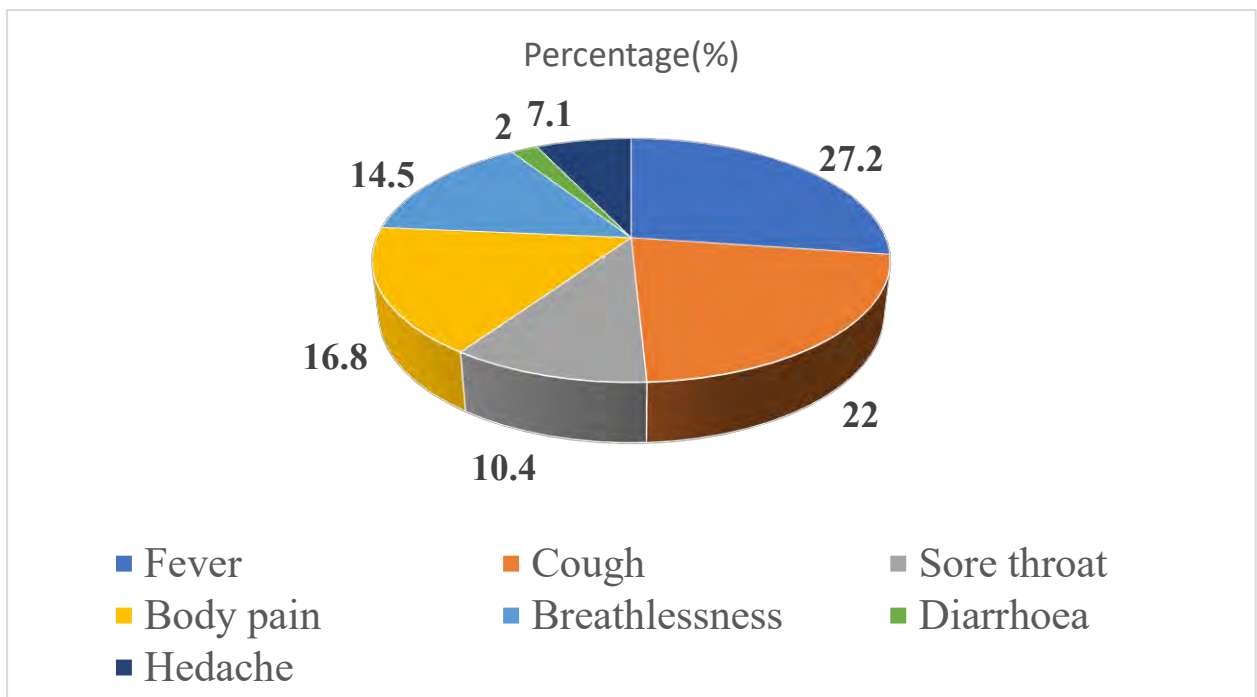
Figure 5: Clinical symptoms among patients.

3.5 Laboratory investigations

Regarding laboratory investigations, we had checked some biochemical test results of the patients. The inflammatory markers as C-reactive protein, S. Ferritin, and D-dimer. To determine the kidney function serum creatinine level was checked alongside the level of serum glutamate pyruvate transaminase tells the liver functionality, also been checked.

Table 2; Biochemical test results statistics between MALE and FEMALE patients.

Biochemical Parameter	Male			Female		
	Mean±SD	Min	Max	Mean±SD	Min	Max
SGPT(U/L) REF- UPTO 42	48.85±34.28	10	180	39.22±26.77	13	168
S.CREATININE (mg/dl) REF- (0.5-1.4)	1.49±1.67	.21	11.76	1.41±1.5236	.46	8.16
CRP (mg/l) REF- (< 10)	77.96±66.76	1.37	276	95.13±81.73	1.07	365.0
D-dimer(µg/ml) REF- (<0.50)	284±1166.40	.05	7716.00	149.47±663.12	.10	5596.00
S. FERRITIN (ng/l)	566.44±896.78	33	6000	400.71±422.70	13.6	1921.0
REF- Male- (24 To 336) ; Female- (11 To 307)						

On admission, all the biochemical test results were found in an elevated state for both male and female patients. Where male patients' result is higher than female patients. SGPT test result is higher than the normal range which is (45.15±31.89) U/L; (Mean±SD). Besides serum creatinine level was also high among patients which is (1.46±1.61) mg/dl; (Mean±SD). All those immunological marker test results were in an elevated state than the normal range CRP = (84.53±74.17) mg/l; (Mean±SD), D-dimer = (232.35±1002.28) µg/ml; (Mean±SD), serum ferritin (502.24±752.68) ng/l; (Mean±SD) (Table-2).

Table 3 : Biochemical test results statistics between DEAD patients and RECOVERED patients.

Biochemical Parameter	Dead patients			Recovered Patients		
	Mean±SD	Min	Max	Mean±SD	Min	Max
SGPT(U/L) REF- UPTO 42	53.36±36.66	15	168	42.26±29.62	10	180
S. Creatinine (mg/dl) REF- (0.5-1.4)	2.31±2.373	.21	11.76	1.14±1.06	.46	8.16
CRP (mg/l) REF- (< 10)	135.30±84.18	3.25	365	65.12±65.12	1.07	261.0
D-dimer(µg/ml) REF- (<0.50)	600.24±1777.01	.17	7716.00	86.59±301.09	.05	2706.0
S. Ferritin (ng/l)	881.12±1223.73	13.6	6000	352.11±353.39	20	1921.0
REF- Male- (24 To 336) ; Female- (11 To 307)						

Another comparison had been made here which shows, the biochemical test result varies in terms of the outcome of the patients. Outcome classified into two different categories. One is recovered and the other one is a dead patient. Recovered patients were 159 (71.6%) in the number who had been discharged from the hospital after being cured. And dead patients 63 (28.4%) in number those were died due to developing different complications during their treatment period in the hospital. (Table-3) shows that patients who died had comparatively higher values of different biochemical test results than those who recovered. This suggests that

22

the more the elevated value of different biochemical parameters the more the chances of developing complications for the patient which in turn reduces the chances of patients recovering from the infection of COVID-19. So different biochemical test parameters can be an indicator to predict which patient is prone to developing complications

3.6 Independent sample t-test

An independent samples t-test was used to compare the mean biochemical test result of SGPT [Male, N=130; Female, N= 81], S. Creatinine [Male, N=133; Female, N= 86], CRP [Male, N= 134; Female, N=83], D-dimer [Male, N= 136; Female, N= 86], S. Ferritin [Male, N=136; Female, N= 86] of hospital admitted COVID-19 patients. Neither Shapiro-Wilk statistic was significant, indicating that the assumption of normality was not violated. Levene's test was also non-significant; thus, an equal variance can be assumed for both groups in terms of SGPT, S. Creatinine, D-dimer, and S. Ferritin biochemical test results. This tells that the biochemical test results do not vary among gender. But in terms of CRP test result Levene's test was significant; thus, an equal variance cannot be assumed and the t-test was statistically significant, with mean CRP test result of females (M=95.13, SD=81.78) significantly higher (mean difference -17.165, 95% CI [-37.22, 2.89]), than the males (M= 77.96, SD=66.76) (Table-4)

Table 4 : Association between gender with Biochemical test result by independent sample T-test

	Gender	N	Mean	Std. Deviation	Std. Error Mean
SGPT(U/L);	Male	130	48.85	34.281	3.007
REF- UPTO 42	Female	81	39.22	26.776	2.975
S. Creatinine	Male	133	1.4974	1.67913	.14560
(mg/dl); REF- (0.5-1.4)	Female	86	1.4101	1.52365	.16430
CRP (mg/l); REF- (< 6)	Male	134	77.9645	66.76754	5.76784
	Female	83	95.1302	81.78237	8.97678
D-dimer	Male	136	284.7699	1166.40872	100.01872
REF- (<0.5) (µg/ml)	Female	86	149.4770	663.12914	71.50705
S. Ferritin (ng/l)	Male	136	566.441	896.7877	76.8989
	Female	86	400.716	422.7018	45.5811
REF- Male- (24 To 336) ; Female- (11 To 307)					

Independent Samples Test

		Leven's test for equality of variances		T-test for equality of means				S.E Differenc e	95% confidence interval of the difference	
		F	Sig.	T	Df	Sig. (2tailed)	Mean Difference		Lower	Upper
SGPT (u/l)	Equal variances assumed	3.099	.080	2.150	209	.033	9.624	4.476	.800	18.448
	Equal variances not assumed			2.275	198.472	.024	9.624	4.230	1.283	17.965
S. Creatinine (mg/dl)	Equal variances assumed	.020	.889	.390	217	.697	.08733	.22416	-.35449	.52914
	Equal variances not assumed			.398	193.915	.691	.08733	.21953	-.34565	.52030
CRP (mg/l)	Equal variances assumed	5.140	.024	-1.687	215	.093	-17.16576	10.17719	-37.2256	2.8940
	Equal variances not assumed			-1.609	148.118	.110	-17.16576	10.67008	-38.2510	3.9194
D-Dimer (μg/ml)	Equal variances assumed	3.066	.081	.980	220	.328	135.29295	138.0983	-136.872	407.457
	Equal variances not assumed			1.100	217.872	.272	135.29295	122.9512	-107.033	377.619
S. ferritin (ng/ml)	Equal variances assumed	2.864	.092	1.604	220	.110	165.7249	103.3317	-37.9218	369.371
	Equal variances not assumed			1.854	206.117	.065	165.7249	89.3928	-10.5167	341.966

3.7 Independent sample t-test

An independent samples t-test was used to compare the mean biochemical test result of SGPT [Dead, N=55; Recovered, N= 156], S. Creatinine [Dead, N=133; Recovered, N= 86], CRP [Dead, N= 60; Recovered, N=157], D-dimer [Dead, N= 63; Recovered, N= 159], S. Ferritin [Dead, N=63; Recovered, N= 159] of hospital admitted COVID-19 patients. Neither Shapiro-Wilk statistic was significant, indicating that the assumption of normality was not violated. Levene's test was also significant; thus, an equal variance cannot be assumed for both groups. The t-test was statistically significant, with the mean SGPT test value of dead patients (M=53.36, SD=36.66) significantly higher (mean difference 11.107, 95% CI [0.197, 22.018]), than the recovered patients (M= 42.26, SD=29.62). In terms of S. Creatinine test value of dead patients (M=2.31, SD=2.37) was significantly higher (mean difference 1.16, 95% CI [0.534, 1.802]), than the recovered patients (M= 1.14, SD=1.06), CRP test value of dead patients (M=135.30, SD=65.12) was significantly higher (mean difference 70.17, 95% CI [46.67, 93.67]), than the recovered patients (M= 65.12, SD=57.98), D-dimer test value of dead patients (M=600.24, SD=1777.01) was significantly higher (mean difference 513.65, 95% CI [63.77, 963.52]), than the recovered patients (M= 86.59, SD=301.09), S. Ferritin test value of dead patients (M=881.82, SD=1223.73) was significantly higher (mean difference 529, 95% CI [216.14, 841.85]) than the recovered patients (M= 252.11, SD=353.39) (Table-5)

Table 5 : Association between patients' Outcomes with Biochemical test results by independent sample T-test.

					Std. Error
	Outcome	N	Mean	Std. Deviation	Mean
SGPT(U/L);	Death	55	53.36	36.661	4.943
REF- UPTO 42	Recovered	156	42.26	29.620	2.371
S. Creatinine	Death	60	2.3117	2.37379	.30645
(mg/dl);	Recovered	159	1.1430	1.06123	.08416
REF- (0.5-1.4)					
CRP (mg/l)	Death	60	135.3018	84.18228	10.86789
REF- (< 6)	Recovered	157	65.1270	57.98778	4.62793
D-dimer	Death	63	600.2438	1777.01286	223.88258
REF- (<0.5) (µg/ml)	Recovered	159	86.5935	301.09778	23.87861
S. Ferritin (ng/l)	Death	63	881.121	1223.7341	154.1760
REF-	Recovered	159	352.119	353.3906	28.0257
M- (24 To 336)					
F- (11 To 307)					

Group Statistics header spans the table.

		Leven's test for equality of variances		T-test for equality of means					95% confidence interval of the difference	
		F	Sig.	T	Df	Sig. 2-tailed	Mean Difference	S.E Difference	Lower	Upper
SGPT (u/l)	Equal variances assumed	5.216	.023	2.242	209	.026	11.107	4.954	1.341	20.873
	Equal variances not assumed			2.026	80.23	.046	11.107	5.483	.197	22.018
S. Creatinine (mg/dl)	Equal variances assumed	46.93	.000	5.030	217	.000	1.16871	.23237	.71073	1.62669
	Equal variances not assumed			3.677	68.09	.000	1.16871	.31780	.53456	1.80286
CRP (mg/l)	Equal variances assumed	17.76	.000	6.983	215	.000	70.17483	10.05001	50.3656	89.98398
	Equal variances not assumed			5.941	81.32	.000	70.17483	11.81222	46.6736	93.67602
D-Dimer (µg/ml)	Equal variances assumed	45.79	.000	3.531	220	.001	513.65029	145.48420	226.929	800.3713
	Equal variances not assumed			2.281	63.41	.026	513.65029	225.15238	63.7768	963.5237
S. ferritin (ng/ml)	Equal variances assumed	24.15	.000	4.967	220	.000	529.0011	106.4937	319.122	738.8795
	Equal variances not assumed			3.376	66.13	.001	529.0011	156.7025	216.146	841.8557

Chapter 4

4.1 Discussion

This cross-sectional descriptive study to describe the clinical features and outcomes of patients with COVID-19 was conducted in Z H Sikder Women's Medical College & Hospital, Dhaka during the pandemic wave in Bangladesh. The enrolled patients were 222 in number. The severity of Covid-19 exceeds other respiratory viral infections as well as global mortality. Besides, the dynamics of the disease are still under research, though a tremendous increase in COVID-19 research since the commencement of the pandemic. Some major research gaps still need to be checked to better understand the nature of infection and the subsequent diseases contributed by coronavirus. Therefore, in this study, we analyzed the clinical progression of the COVID-19 hospital-admitted patient.

In our study among the participants the percentage of male (61.3%) patients were higher than female (38.7%) those were infected by SARS-COV-2(Figure-2). (Huang C et al. 2020) and (Richardson et al. 2020) respectively found similar findings in Wuhan (73%) and New York (60%) which tells that males are more susceptible to COVID-19 than females. The reason behind this may be due to several factors including high expression of coronavirus receptors (ACE2) in men (Lu R et al.,2020; Li W et al., 2007). Alongside reduced susceptibility of females to such viral infections could be attributed to protection from the X chromosome and the sex hormone estrogen which play an important role in innate and adaptive immunity (channappanavar et al.,2017). Typically, males are generally more involved in outdoor activities than females in the context of Bangladesh. Some behavioral characteristics are also a factor to consider such as smoking which is more frequent in men than in women and thus increases the risk of pneumonia and secondary infections after COVID-19.

In our study the most of the patients were elderly. The mean age was 55, and this vulnerable group mostly required hospital care. Meuller et al., (2020) referred weak immune function of elderly people as the reason for being affected mostly. Aging is independently associated with increased COVID-19 mortality, since our cases were mainly elderly with at least one comorbidity including hypertension, CVD, Diabetes, and kidney disease.

With respect to comorbidities, we have found hypertension (48.3%) and diabetes (33.9%) are the dominant co-morbidities among the respondent patients (Figure-3). Studies conducted in similar settings reported the same that hypertension and diabetes are commonly comorbid conditions in hospitalized patients (Hasan MJ et al.,2021; Mowla SGM et al.,2020; Guan WJ et al.,2020). A study was conducted where it stated that Significant sociodemographic and comorbidity differences were observed between males and females ($p < 0.05$). In addition, multiple logistic regression showed that hypertension and diabetes were significantly more frequent in males [adjusted odds ratio (OR) = 66.19 and OR = 22.90] (Samer et al.,2022). Moreover, hypertension is the most chronic disease that can increase the severity of COVID-19 since Angiotensin-converting enzyme 2 (ACE2) receptors, which interact with the COVID-19 virus and facilitate the penetration into the cell are involved in hypertension pathogenesis and the association between hypertension and disease severity has been established in earlier research. (Hamming I et al.,2004; Huang S et al.,2020).

Among the in-hospital characteristics, the most frequently reported symptom was fever (n= 220,27.2%) and a large portion had a cough (n= 178,22.0%). Another leading complaint has been found body aches or pain (n= 136,16.8%). Breathlessness, headache, sore throat, and diarrhea were also recorded among patients (Figure-5). Tahsin et al., (2022) reported fever, fatigue, body pain, Headache, dry cough, sore throat, productive cough, shortness of breath and chest pain, reduced sense of smell and taste, gastrointestinal symptoms, loss of appetite, and abdominal pain which was observed in Dhaka city COVID-19 infected patients besides these

symptoms were persistent even after they had reached RT-PCR negativity. 76.2% (N=522) of patients reported persistent symptoms. In terms of such symptoms during COVID-19 illness and consistency was found with Guan et al., (2020a), Hossain et al., (2020), and Yang X et al., (2020).

In terms of vital signs, the median heart rate was 90 beats per min, the temperature was 98 ° C, and oxygen saturation (SpO^2) was 95%. The median systolic and diastolic blood pressure were 120 and 80 respectively. This tells us that patients who came for hospital admission mostly had shortness of breath due to their low oxygen saturation rate and their body temperature is also slightly elevated (Table-1). Modhusudon Shaha et al., (2021), and Hasabo et al., (2021) reported similar findings and they found the respiratory rate was over 24 breaths per minute.

When it comes to biochemical parameters elevated CRP, D-dimer, Serum Ferritin, Serum SGPT, and serum creatinine were observed among the patients (Table-2). Which is consistent with other studies (Richardson et al., 2020; Mazin Barry et al., 2021). We had found a positive correlation between these biochemical test parameters and the severity of COVID-19 which comes as an outcome. Through Leven's T-test, we have found dead patient test value is higher than recovered patients. Using these parameters may help to identify patient disease progression and decide management of care.

Covid-19 was found to influence the functionality of other body organs. Serum SGPT (Serum Glutamic Pyruvic Transaminase) level in patients is a potential marker of liver functionality. Abnormality in it provokes liver damage similarly serum creatinine tells us the kidney functionality and the elevation of it indicates kidney injury and requires immediate attention since if it remains unchecked kidney failure might occur which is life-threatening for the patient (Gowda et al. 200). Modhusudon et al. (2021) showed Heightened AST (Aspartate transferase) level also had increased due to COVID-19 infection and high AST level possess a threat for

heart failure. Therefore, these suggest that COVID-19 infection not only damages the respiratory tract but also the Heart, Liver, and Kidney.

A large body of clinical work investigating the abnormalities in immunological parameters of COVID-19 disease documented high D-dimer, Ferritin, and CRP values (Guan WJ et al., 2020; Xiong Y et al., 2020). Besides in order to predict the severity of the disease or disease results relying on these parameters is more efficient than the CT value which is a measure of viral load in an individual yielded through RT-PCR test for COVID-19 detection (Mardani et al., 2020). Rabban et al., (2021) stated that various factors could affect Ct values such as Preanalytical variables (sample collection technique, type of specimen, sampling time, viral kinetics), analytic variables (Different detection kit, internal protocol, type of RT-PCR, purity of reagents and pipetting error), post-analytical variables (Interpreting the report). Due to these effects on the Ct value, the impact of the general mean of it becomes less efficient in order to predict the disease severity since a low Ct value denotes a high viral load and a higher value means a lower viral load in an individual. In several clinical studies consisting of small or large sample sizes, several discrepancies exist regarding a significant positive correlation between the Ct value and disease severity in COVID-19 (Rabaan et al., 2021). In our findings, we also found similar observations.

In our study, 71.6 % of patients recovered after hospital admission, and 28.4 % of patients couldn't survive (Figure-2). The causative agents or factors behind such mortality have been discussed above. Since there was inadequate evidence-based specific treatment procedure or protocols against COVID-19 which is still an unfamiliar virus to humankind. The initial target was to suppress the severity of the patient based on the symptoms or conditions that developed. In terms of treatment during the hospital stay, patients were given single or combination antibiotic therapy mainly azithromycin, doxycycline, amoxicillin, ciprofloxacin, levofloxacin, etc. Antiviral therapy includes remdesivir, favipiravir, and monoclonal antibody tocilizumab.

Besides supplementary drugs like zinc, Vitamin D, C, E, and various multivitamins. Another medicine like antiparasitic ivermectin, anticoagulants, and corticosteroids was also been used. Another study also showed similar treatment protocols in patients who were COVID-19 infected in Dhaka city (Tahsin et al., 2022). The use of intravenous immunoglobulin (Tocilizumab) for patients who were severely ill. Interestingly the use of it was higher in nonsurvivors but much lower in survivors. Among the dead patients, 12.7 % received tocilizumab during their treatment whereas among recovered patients only 3% received that drug. Similar kind of findings had shown by Yingzhen Du et al., (2020).

4.2 Conclusion

In contrast to earlier findings globally and in Bangladesh, we had concluded that the older population is mostly affected by COVID-19 infection. Most of them needed hospital care and some of them needed immediate ICU support. Co-morbidities worsen the disease outcome and increase mortality and the most common was hypertension and diabetes. Most of the patients were symptomatic and carried various types of symptoms. In terms of vital signs, most of the patient's oxygen saturation was below the normal range which indicates patients had breathing difficulties and some of them needed immediate oxygen support. Some biochemical test results such as SGPT, Serum Creatinine, and Serum Ferritin were higher than the normal range which tells us how COVID-19 infection initiates different organ damage which in turn cause the patient condition to become more unstable. Besides immunological parameters like CRP, the D-dimer range was also in an elevated state and this indicator tells us the prognosis of the disease besides how severe the patient's condition is after being infected by COVID-19. There was an association between patient outcomes and biochemical test results. Where a certain difference had been observed in terms of survivor and nonsurvivor patients and biochemical test results can be used as an indicator for the patient's condition forecasting. These clinical features of COVID-19-infected patients should be handy for further research which will tell us in the future about the actual dynamics of COVID-19 and the consequences of different outcomes.

References

1. Barry, M., Althabit, N., Akkielah, L., AlMohaya, A., Alotaibi, M., Alhasani, S., Aldrees, A., AlRajhi, A., AlHiji, A., Almajid, F., AlSharidi, A., Al-Shahrani, F. S., Alotaibi, N. H., & AlHetheel, A. (2021). Clinical characteristics and outcomes of hospitalized COVID-19 patients in a MERS-CoV referral hospital during the peak of the pandemic. International journal of infectious diseases : IJID : official publication of the International Society for Infectious Diseases, 106, 43–51. https://doi.org/10.1016/j.ijid.2021.03.058

2. Centers for disease control and Prevention (CDC).

3. Channappanavar, R., Fett, C., Mack, M., Ten Eyck, P. P., Meyerholz, D. K., & Perlman, S. (2017). Sex-Based Differences in Susceptibility to Severe Acute Respiratory Syndrome Coronavirus Infection. Journal of Immunology (Baltimore, Md. : 1950), 198(10), 4046–4053. https://doi.org/10.4049/jimmunol.1601896

4. Cherry, J., Krogstad, P. SARS: The First Pandemic of the 21st Century. Pediatr Res 56, 1–5 (2004). https://doi.org/10.1203/01.PDR.0000129184.87042.FC

5. Chowdhury, M. R., Mas-Ud, M. A., Ali, M. R., Fatamatuzzohora, M., Shimu, A. S., Haq, M. A., Islam, M. A., Hossain, M. F., Hosenuzzaman, M., Islam, M. M., Hasan, M. F., & Matin, M. N. (2021). Harmful Effects of COVID-19 on Major Human Body Organs: A Review. Journal of Pure and Applied Microbiology, 15(2), 500–511. https://doi.org/10.22207/jpam.15.2.14

6. COVID-19 Dynamic Dashboard for Bangladesh, MIS-DGHS & IEDCR.

7. Du, Y., Tu, L., Zhu, P., Mu, M., Wang, R., Yang, P., Wang, X., Hu, C., Ping, R., Hu, P., Li, T., Cao, F., Chang, C., Hu, Q., Jin, Y., & Xu, G. (2020). Clinical Features of 85 Fatal Cases of COVID-19 from Wuhan. A Retrospective Observational Study. American journal of respiratory and critical care medicine, 201(11), 1372–1379. https://doi.org/10.1164/rccm.202003-0543OC

8. Eastin, C., & Eastin, T. (2020). Clinical Characteristics of Coronavirus Disease 2019 in China: Guan W, Ni Z, Hu Y, et al. N Engl J Med. 2020 Feb 28 [Online ahead of print] DOI: 10.1056/NEJMoa2002032. The Journal of Emergency Medicine, 58(4), 711–712. https://doi.org/10.1016/j.jemermed.2020.04.004

9. Gowda, S., Desai, P. B., Hull, V. V., Math, A. A., Vernekar, S. N., & Kulkarni, S. S. (2009). A review on laboratory liver function tests. The Pan African medical journal, 3, 17.

10. Hamming, I., Timens, W., Bulthuis, M. L., Lely, A. T., Navis, G., & van Goor, H. (2004). Tissue distribution of ACE2 protein, the functional receptor for SARS coronavirus. A first step in understanding SARS pathogenesis. The Journal of Pathology, 203(2), 631–637. https://doi.org/10.1002/path.1570

11. Hasabo, E.A., Ayyad, F.A., Alam Eldeen, S.A.M. et al. Clinical manifestations, complications, and outcomes of patients with COVID-19 in Sudan: a multicenter observational study. Trop Med Health 49, 91 (2021). https://doi.org/10.1186/s41182-021-00382-4

12. Hossain, M. M., Tasnim, S., Sultana, A., Faizah, F., Mazumder, H., Zou, L., McKyer, E. L. J., Ahmed, H. U., & Ma, P. (2020). Epidemiology of mental health problems in COVID-19: a review. F1000Research, 9, 636. https://doi.org/10.12688/f1000research.24457.1

13. Huang C, Wang Y, Li X, Ren L, Zhao J, Hu Y, Zhang L et al. Clinical features of patients infected with 2019 novel coronavirus in Wuhan, China. Lancet. 2020 Feb 15;395(10223):497-506. Doi: 10.1016/S0140-6736(20)30183-5. Epub 2020 Jan 24. Erratum in: Lancet. 2020 Jan 30; PMID: 31986264; PMCID: PMC7159299.

14. Huang, S., Wang, J., Liu, F., Liu, J., Cao, G., Yang, C., Liu, W., Tu, C., Zhu, M., & Xiong, B. (2020). COVID-19 patients with hypertension have more severe disease: A multicenter retrospective observational study. Hypertension Research, 43(8), 824-831. https://doi.org/10.1038/s41440-020-0485-2

15. Khan, T. S., Shirin, T., Alam, A. N., Shakhider, M. A. H., & Haque, F. (2022). Follow-up of practiced treatment regimens and health conditions of patients following recovery from COVID-19 residing in Dhaka City: a survey-based, descriptive, cross-sectional study. IJID regions, 3, 68–75. https://doi.org/10.1016/j.ijregi.2022.03.005

16. Kharroubi, S. A. (2022). Sex-differences in COVID-19 diagnosis, risk factors, and disease comorbidities: A large US-based cohort study. Frontiers in Public Health, 10. https://doi.org/10.3389/fpubh.2022.1029190

17. Li, W., Sui, J., Huang, I. C., Kuhn, J. H., Radoshitzky, S. R., Marasco, W. A., Choe, H., & Farzan, M. (2007). The S proteins of human coronavirus NL63 and severe acute respiratory syndrome coronavirus bind overlapping regions of ACE2. Virology, 367(2), 367–374. https://doi.org/10.1016/j.virol.2007.04.035

18. Liu, T., Liang, W., Zhong, H., He, J., Chen, Z., He, G., Song, T., Chen, S., Wang, P., Li, J., Lan, Y., Cheng, M., Huang, J., Niu, J., Xia, L., Xiao, J., Hu, J., Lin, L., Huang, Q., Rong, Z., … Ma, W. (2020). Risk factors associated with COVID-19 infection: a retrospective cohort study based on contacts tracing. Emerging microbes & infections, 9(1), 1546–1553. https://doi.org/10.1080/22221751.2020.1787799

19. Lu, R., Zhao, X., Li, J., Niu, P., Yang, B., Wu, H., Wang, W., Song, H., Huang, B., Zhu, N., Bi, Y., Ma, X., Zhan, F., Wang, L., Hu, T., Zhou, H., Hu, Z., Zhou, W., Zhao, L., Chen, J., … Tan, W. (2020). Genomic characterization and epidemiology of 2019 novel coronavirus: implications for virus origins and receptor binding. Lancet (London, England), 395(10224), 565–574. https://doi.org/10.1016/S0140-6736(20)30251-8

20. Mardani, R., Ahmadi Vasmehjani, A., Zali, F., Gholami, A., Mousavi Nasab, S. D., Kaghazian, H., Kaviani, M., & Ahmadi, N. (2020). Laboratory Parameters in Detection of COVID-19 Patients with Positive RT-PCR; a Diagnostic Accuracy Study. Archives of academic emergency medicine, 8(1), e43.

21. Milne-Price, S., Miazgowicz, K. L., & Munster, V. J. (2014). The emergence of the Middle East respiratory syndrome coronavirus. Pathogens and disease, 71(2), 121–136. https://doi.org/10.1111/2049-632X.12166

22. Mueller, A. L., McNamara, M. S., & Sinclair, D. A. (2020). Why does COVID-19 disproportionately affect older people? Aging, 12(10), 9959–9981. https://doi.org/10.18632/aging.103344

23. Rabaan, A. A., Tirupathi, R., Sule, A. A., Aldali, J., Mutair, A. A., Alhumaid, S., Muzaheed, Gupta, N., Koritala, T., Adhikari, R., Bilal, M., Dhawan, M., Tiwari, R., Mitra, S., Emran, T. B., & Dhama, K. (2021). Viral Dynamics and Real-Time RT-PCR Ct Values Correlation with Disease Severity in COVID-19. Diagnostics (Basel, Switzerland), 11(6), 1091. https://doi.org/10.3390/diagnostics11061091

24. Richardson S, Hirsch JS, Narasimhan M, Crawford JM, McGinn T, Davidson KW; the Northwell COVID-19 Research Consortium; Barnaby DP, Becker LB, Chelico JD, Cohen SL, et al. Presenting Characteristics, Comorbidities, and Outcomes Among 5700 Patients Hospitalized With COVID-19 in the New York City Area. JAMA. 2020 May 26;323(20):2052-2059. Doi: 10.1001/jama.2020.6775. Erratum in: JAMA. 2020 May 26;323(20):2098. PMID: 32320003; PMCID: PMC7177629.

25. Shaha, M., Islam, M. A., Huq, F., Roy, B., Kabir, M. A., Salimullah, M., Al Mahtab, M., & Akbar, S. M. (2021). Clinical Manifestations of Hospitalized COVID-19

Patients in Bangladesh: A 14-day Observational Study. Euroasian journal of hepato-gastroenterology, 11(1), 14–20. https://doi.org/10.5005/jp-journals-10018-1340

26. Underlying Medical Conditions Associated with Higher Risk for Severe COVID-19: Information for Healthcare Professionals, (CDC)

27. Vital Signs (Body Temperature, Pulse Rate, Respiration Rate, Blood Pressure), The Johns Hopkins Hospital, and Johns Hopkins Health System

28. World health organization (WHO)

29. Xiong, Y., Sun, D., Liu, Y., Fan, Y., Zhao, L., Li, X., & Zhu, W. (2020). Clinical and High-Resolution CT Features of the COVID-19 Infection: Comparison of the Initial and Follow-up Changes. Investigative radiology, 55(6), 332–339. https://doi.org/10.1097/RLI.0000000000000674

30. Yang, X., Yu, Y., Xu, J., Shu, H., Xia, J., Liu, H., Wu, Y., Zhang, L., Yu, Z., Fang, M., Yu, T., Wang, Y., Pan, S., Zou, X., Yuan, S., & Shang, Y. (2020). Clinical course and outcomes of critically ill patients with SARS-CoV-2 pneumonia in Wuhan, China: a single-centered, retrospective, observational study. The Lancet. Respiratory medicine, 8(5), 475–481. https://doi.org/10.1016/S2213-2600(20)30079-5

31. Young, B. E., Ong, S. W. X., Kalimuddin, S., Low, J. G., Tan, S. Y., Loh, J., Ng, O. T., Marimuthu, K., Ang, L. W., Mak, T. M., Lau, S. K., Anderson, D. E., Chan, K. S., Tan, T. Y., Ng, T. Y., Cui, L., Said, Z., Kurupatham, L., Chen, M. I., Chan, M., … Singapore 2019 Novel Coronavirus Outbreak Research Team (2020). Epidemiologic Features and Clinical Course of Patients Infected With SARS-CoV-2 in Singapore. JAMA, 323(15), 1488–1494. https://doi.org/10.1001/jama.2020.3204

32. Zhu, H., Wei, L., & Niu, P. (2020). The novel coronavirus outbreak in Wuhan, China. Global health research and policy, 5, 6. https://doi.org/10.1186/s41256-020-00135-6