Original Article

Effects of hypertension on the outcomes of Covid-19 infected patients- A retrospective study

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Abstract:

Background: *Hypertension has been reported as the most prevalent comorbidity in patients with corona virus disease 2019 (COVID-19) .Since hypertension is exceedingly frequent in the elderly and older people appear to be at particular risk of being infected with SARS-COV-2 virus and of experiencing severe forms and complications of COVID-19.*

Objective : *This retrospective study aim to compare the outcomes in COVID-19 infected patients with or without hypertension.*

Method : *Atotal 180 hospitalized patients with laboratory confirmed COVID-19 were included. The medical record including clinical feature, history of hypertension were included in this study. This study was conducted in COVID-19 ICUof Bangabandhu Sheikh Mujib Medical University from August 2020 to January 2021.Informationwere obtained frommedical record including clinical features, complication,treatments and clinical outcome were extracted for the analysis.*

Results: *There were 180 patients selected for this study. 50(27.8%) patients had 51-60 years ,79(43.5%) patients had61-70 years and 27(15%) patients had 71-80 years.This study showed that 71.7% patients was hypertensive and 29.3% patients was non-hypertensive. In total 180 patients, mortality rate was 65.1% in hypertensive patientsand mortality rate was41.1% in non-hypertensivepatients.Among them patients comorbidity was 50% Diabetes mellitus,14% Bronchial asthma,14% patients Ischemic heart disease, 11% Chronic Kidney disease ,6% hypothyroidism and 5% cerebrovascular disease.*

Conclusion: *This study concluded that hypertension does not affect the outcome of COVID-19. Compared with the group of survivors and non-surviving COVID-19 patients with hypertension, most of the patients were older and had more comorbidity.*

Keywords : *COVID-19,Coronavirus disease, Hypertension, Clinical characteristics, Comorbidites, Mortality, Morbidity, ACE2,*

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Introduction:

In recent months coronavirus disease 2019(COVID-19) has posed a substantial threat to human health world wide and has imposed a major burden on the global healthcare system[1,2].

Early investigations on the clinical characteristics of the patients with COVID-19 infection have found that comorbidities significantly increase the risk of severe clinical outcomes such as mortality, ICU admission and mechanical ventilation[3,4]. One of the most common comorbidities among COVID-19 patients is hypertension with a prevalence ranging from 16.9 to 32.2% in hospitalized patient in china[5]. Hypertension was also the most common comorbidity in ICU patient in Lombardy, Italy (49%) and hospitalized COVID-19 patients in New York USA(56.6%)[6,7.] The mechanism of exacerbation associated with underlying conditions remains unclear, and expert worldwide have called in depth analysis of

blood pressure control in hypertension patients during the clinical course of COVID-19[8].The mechanisms of exacerbation of underlying cardiovascular condition after COVID-19 infection remain unclear. One of the cited hypothesis is overexpression of angiotensinconverting enzyme II(ACE2) in arterial endothelial and smooth muscle cells. A recent experimental study demonstrated elevated levels of ACE2 in the cardiomyocytes of patientswith heart diseas[9].Similar to SARS-COV, the causal pathogen of COVID-19, SARS-COV-2 virus also target,ACE2 receptors as entry points human host cells[10,11].Two of these RASS inhibitors, angiotensin II receptor blockers (ARBS) and ACE inhibitors (ACEs) have caused great concern due to their direct interactions withACE2and ACE2 receptor[12] Notably DM was the second most common comorbidity found in hospitalized patients with COVID-19[12]. As a result, concern have been raised that ARB and ACEI drugs could result in overexpression of ACE2, facilitating virus entry and increasing susceptibility to and the clinical severity of COVID-19 infection[13]. The objective of this study was to evaluate the risk and severity of COVID-19 among with comorbid hypertension.

Method:

This was aretrospectivestudy conducted in the department of Anaesthesia,Analgesia and Intensive Care Medicine in COVID-19 ICU of Bangabandhu Sheikh Mujib Medical University over the period from August 2020 to January 2021.This study was approved by ethics committee and written informedconsent were obtained.The inclusion criteria were as follows1. Adults>18 years old[2]. Laboratory (RT-PCR) confirmation of severe acute respiratory syndromes coronavirus(SARA-COV-2) infection inthroat swab, sputum and lower respiratory tract samples and[3]. In hospital treatment >72 hours.Total 180 patients were enrolled in this study,they were divided into hypertensive group and non-hypertensivegroup.In hypertensive group, data was obtained from male and female patients according the age group. In non-hypertensive group data was obtained from male andfemale patientsaccording to age. Mortality rate was obtained from hypertensive group and non-hypertensive group. In this study we also recorded comorbidity such Diabetes Mellitus, Bronchial asthma, Chronic Kidney disease, Cerebrovascular disease, Hypothyrodism, and Ischemic heart disease. All data were analysedby student-ttest& percentage colum done .

Results:

Table-1: Distribution of hypertensive patients and non-hypertensive patients by age

Age	**Hypertensive patients**		**Non-hypertensive Patients**		**Total**
	Male	**female**	**Male**	**Female**	
41-50	4	7	6	2	19(10.5%)
51-60	27	10	8	5	50(27.8%)
61-70	45	15	11	8	79(43.5%)
71-80	16	2	5	4	27(15%)
81-90	2	1	1	1	5(2.7%)
91-100	1	0	0	0	1(0.5%)
Total	95	34	31	20	180
Mean ±SD	64.4±8.34	61.9±7.26	59.6±7.35	61.8±8.54	62.2±7.81

Values are expressed as Mean+ SD and within parenthes percentage(%) over column in total
This table showing that 43.5% patients age was 61-70 years.Mean age was 62.2±7.81.

Table 2:Distribution of Hypertension and Nonhypertension groups

Character	**Male(n=126)**	**Female(n=54)**	**Total(n=180)**
Hypertension	95(73.65%)	34(26.35%)	129(71.7%)
Non-hypertension	31(60.8%)	20(39.2%)	51(29.3%)

Table 2 - shows that 71.7% patients was hypertensive out of 180 patients and 29.3% patients was non hypertensive out of 180 patients

Table-3 : Distribution of patients by mortality

character	Mortality	Total Patients	Mortality Rate
Hypertensive	84	129	65.1%
Non-hypertensive	21	51	41.1%
Total	105	180	58.3%

Table 3.shows that total 180 patients mortality rate was 65.1% in hypertensive patients and mortality rate was 41.1% in non-hypertensive patients and total mortality was 58.3% out of 180 patients.

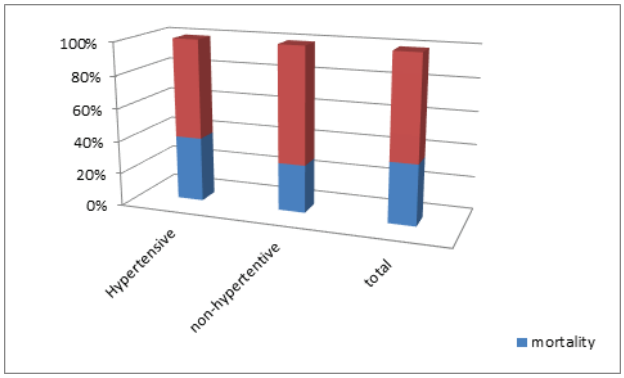

Figure 1: Presentation of Mortality

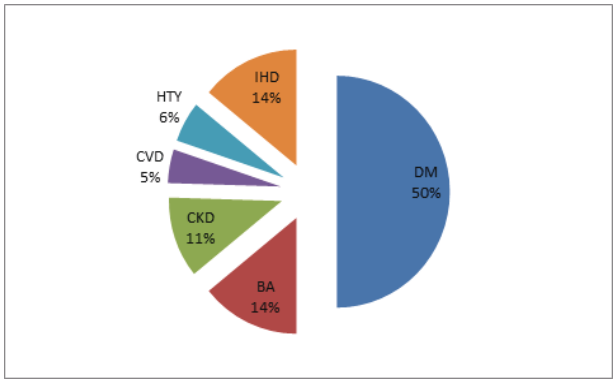

Figure-2: Presentation of Comorbidity

Figure-2 shows that comorbidity among the patients out of 180 patients, 50% Diabetes mellitus, 14% had Bronchial asthma, 14% had Ischemic heart disease, 11% had chronic kidney disease,6% had Hypothyroidism and 5% had Cerebrovascular disease

Discussion:

Compared to the diseases associated with previous corona virus epidemics,such as the Severe Acute Respiratory Syndromes,and Middle East Respiratory Syndromes COVID-19 is more severe and has afaster spread14.SARS-COV-2 enters the cellthrough the ACE2 receptor15.Due to interaction between SARA-COV-2 and ACE^2,it is believed that hypertension may be related to the pathogenesis of COVID-19 by working directly as a previous clinical predictor of the disease severity or by feeding to late deterioration in the disease process[16].In our retrospective study shows that patients had 50(27.8%) in 51-60 years, 79(43.5%) had 61-70 years and 27(15%) had 71-80 years.Mean age was62.2± [7.8]. Among 180 patients 71.7% patients was hypertensive and 29.3% patienswas non hypertensive. In other study we

found the median age of the COVID-19 patients was 60 years and the prevalence rate of hypertension was 32.5%. They found no difference in the patients sex distribution, but the patients were older and high blood pressure17.Based on the recently published clinical and epidemiological charactertistics of COVID-19 patients[18.] Several editorials and review published in famous cardiology journals, pointed to the higher risk of COVID-19 infection, the more severe disease and augmented mortality out comes among the infected elderly19.As reviewed elsewhere, it has been stated male patients had higher expression of angiotensin- converting enzyme2(ACE2) which may be regulated by male sex hormones rendering them to more risk for SARS-COV-2 infection and poor clinical outcome20.In our retrospective study out of 180 patients mortality rate was 65.1% in hypertensive patients and 41.1%in non-hypertensivepatients and total mortality was 58.3%. However, there was no sufficient evidence to show that subjects with hypertension are more likely to be diagnosed with the severe COVID-19 illness or proceed to poor clinical outcome including death due to COVID-19 than those with hypertension.In this retrospective study shows that comorbidity among the patient out of 180 patients, 50% patients had Diabetes mellitus, 14% Bronchial asthma, 14% had Ischemic heart disease, 11% had chronic kidney disease,6% Hypothyroidism and 5% had cerebrovascular disease.Comorbidity may also reduce immune function. For example, in diabetic patients, natural immune function reduced substantially which may restrict the body to produce respective antibody against any infection[21].Since natural immunity is declined profoundly in comorbid conditions and as patients are taking more drugs concurrently, the notorious adverse drug reaction alongside downregulation of immune function may expected to occur in these patient and may increase risk of mortality eventually.

Conclusion:

This study concluded that hypertension does not affect the outcome of COVID-19.Compared with the group of survivors and non-surviving COVID-19 patients with hypertension, most of the patient were olderand had more comorbidity.

References:

1. Ahn DG, Shin HJ, Kim MH, etall. Current status of epidemiology, diagnosis,therapeutics, and vaccines for novel coronavirus disease2019 (COVID-19).J Microbiol Biotechnol. 2020;30: 313-324.
2. BlackJ, BalleyC,Przewrocka J,et all. COVID_-19: The case for health-care worker screening to prevent hospital transmission.LANCET. 2020;395:1418-1420.
3. Huang C,WangY,LiX,RenL,ZhaoJ,HuY, et all. Clinical features of patients infected with 2019 novel corona virus inWuhan,China. LANCET. 2020;395:495-506.
4. Wang D,HuB,HuC ,ZhuF ,LiuX ,Zhang J ,et all .Clinical characteristics of 138 hospitalized patients with 2019 novel corona virus- infected pneumonia in wuhan, China. JAMA.2020;323:1061-9.
5. GuanWJ, Liang WH, Zhao Y, Liang HR, ChenZS,LiYM,etall.Comorbidity and its impact on 1590 patients withCOVID-19 in china: a national wide analysis.EurRespir J. 2020;55:2000547.
6. GrasselliG,Zangrillo A, ZanellaA,AntonelliM, Cabrini L, CastelliA, et all. Base line characteristics and outcomes of 1591 patients infected with SARS-COV-2 admitted to ICUs of the Lombardy Region,Italy. JAMA. 2020;323: 1574-81.
7. RichardsonS, HirschJS,NarasimhanM, Crawford JM, McGinnT,DavidsonKW,et all. Presenting characteristics ,comorbidities and outcomes among 5700 patients hospitalized with COVID-19 in New York city Area.JAMA.2020;323:2052-9.
8. ClarkCE, McDonaghSTJ, McManus R, Martin U. Covid-19 and hypertension risks and management https// blogs. Bmj.com/bmj/ 2020/04/15/covid-19 and- hypertension-risks-and-management/Accessed 17 April 2020.
9. NicinL, AbplanalpWT, MellentinH, KattihB, TomborL ,JohnD, et all. Celltype-specific expression of the putative SARS-COV-2 receptor ACE2 in human hearts. EUR Heart j. 2020;41:1804-6.

10. ZhouP, Yang XL, Wang XG, Hu B, Zhang L,ZhangW, et all.A pneuomonia outbreak associated with a new coronavirus of probable bat origin. Nature .2020;579:270-3.
11. Hamming I, Timens W, Bulthuis ML, Lely AT, NavisG, Van Goor H. Tissue distribution of ACE2 protein , the functional receptor for SARS coronavirus. A first step in understanding SARS pathogenesis.JPatho .2004;203:631.
12. Sanders JM, Monogue ML, Jodlowski TZ, Cutrell JB. Pharmacologic treatments for corona virus disease 2019 (COVID-19).A review .JAMA .2020.https:/doi.org/10.1001/jama.2020.6019.
13. Fang L, Karakiulaks G, RothM, .Are patients with hypertension and diabetes mellitus at increased risk for COVID-19 infection?LancetRespirMed . 2020;8:21.
14. Datta PK, Liu F, Fisher T, Rapparot J, Qin X.SARS-COV2 pandemic and research gaps: understanding SARS-COV-2 interaction with ACE2 receptor and implications for therapy.Theranostics. 2020;10(16):7448-7464.
15. WallsAC,ParkYJ,Tortorci MA, WallA, McGuire AT, Veesler D,. Structure, function and antigenicity of the SARS-COV-2 spike glycoprotein cell.2020;181(2):281-292.e6.
16. LippiG,WongJ,Henry BM. Hypertension in patient with corona virus disease 2019(COVID-19); a pooled analysis. Pol Arch Intern Med .2020;130(4):304-309.
17. HuangS,WangJ,LiuF,et all. COVID-19 patients with hypertension have more severe disease: a multicenter retrospective observational study .Hypertens Res.2020;43(8):824-831.
18. ZhouF, YUT,DUR, FANG,LiuY,Liuz,et all. Clinical course and risk factors for mortality of adults in patients with COVID-19 in Wuhan ,China : a retrospective cohort study, Lancet. 2020;395:1054-62.
19. LaceyB, LewingtonS, Clarke R, Kong XL, Chen YP, Guoy ,et all. Age –specific association between blood pressure and vascular and nonvascular chronic disease in 0.5 million adults in china ; a prospective cohort study, Lancet Glob Health .2018;6:41-9.
20. LengJ, Goldstein DR. Impact of aging on viral infection . Microbes infect.2010;12(14-15):1120-4.
21. BerbudiA, Rahmadika N, Cahyadi AL, Ruslami R. Type 2 diabetes and its impact on the immune system. Curr Diabetes Rev. 2020;16(%):442-9.