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ORIGINAL ARTICLE

Emphasise the effect of Covid-19 patients on antihypertensive drugs in a tertiary care hospital – a cross sectional study

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Abstract

Objectives: The SARS-CoV-2-associated pneumonia (COVID-19) infection has spread quickly throughout China and the rest of the world since December 2019. SARS-CoV-2 has been demonstrated to interact with the RAAS and endothelin systems to both initiate "de novo" onset hypertension and exacerbate pre-existing instances. This study described the clinical symptoms, therapeutic outcomes of COVID in 19 patients with hypertension. **Methods:** Data collection forms were used to gather information on demographics, clinical, laboratory, radiological parameters and treatment outcomes from the medical records provided by 195 Covid-19-infected patients admitted to the KMCH institute of health sciences and research in Coimbatore. The 2019-CoV RNA real-time reverse transcription polymerase chain reaction (RT-PCR) assay was developed to test patients with Covid-19. The patients were split into normotensives (137) and hypertensives (58) with covid infection. **Results and Discussion:** CORADS score was used to classify the severity of Pneumonia. None of the hypertensives had a severity score of 3. 15.35% had a severity score of 2 and 82.8% had a severity score of 1. When the severity score was compared with normotensives, there was no significant difference among both-the groups. None of the patient needed intensive care. The means of various clinical (blood and physical) parameters were compared between hypertensives and non-hypertensives. The mean age of hypertensives was 58.7 compared to 42.44 among normotensives ($P<0.001$). No significant difference among both the groups with respect to SPO2, Plasma Glucose (random), sodium, potassium, chloride, systolic blood pressure and hospital stay. There was a significant difference in diastolic blood pressure. ($p<0.05$). **Conclusion:** Results of this study showed difference in the treatment outcome in hypertensives compared to normotensives is not significant. *p* values that lack statistical significance may not accurately represent the state of the entire population.

Keywords*:* COVID-19, Hypertension, Clinical profile, Treatment outcome

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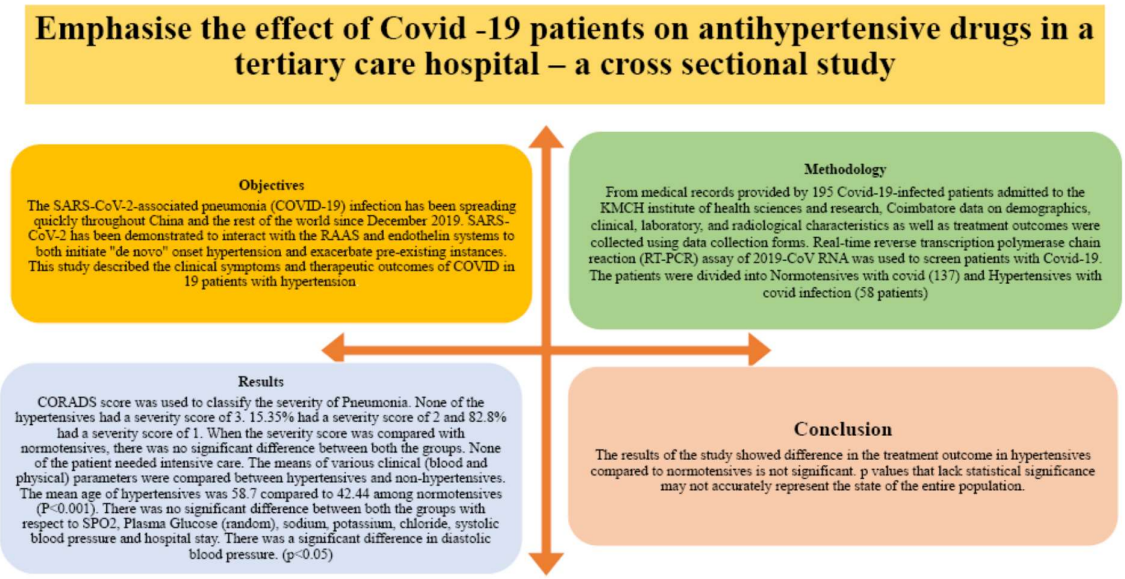
Graphical Abstract



Introduction

The Severe Acute Respiratory Syndrome Coronavirus 2 (SARS-CoV-2) is the virus that is causing the aggressive coronavirus disease (COVID-19) pandemic. SARS-CoV-2 disease is renamed to COVID-19 on February 11, 2020 by the World Health Organization (WHO). The majority of the biomedical scientific community's research efforts have been focused on understanding the etiology, epidemiology, diagnosis, and treatment of COVID-19 pandemic, and a plethora of new information is currently being gleaned daily about the sickness [1]. COVID-19 has tropism for ACE2 receptors present in most of the organ system and produces molecular and macroscopic changes. Arterial hypertension appears to have received less attention than the other post-COVID indications and symptoms documented in the literature. Doctors frequently minimize arterial hypertension relevance and danger, despite of one of the factor for nearly all known adverse cardiovascular events, renal illness, and end organ damage. Unfortunately, research conducted after COVID has also revealed this tendency to overlook one of the biggest silent killers in history [2]. Even though it has been shown that COVID-19 interacts with the RAAS and endothelin systems to both cause obesity, drugs and endocrine related hypertension and worsen cases of pre-existing cases, only few results are available in the literature [3,4]. This concern stems from the fact that COVID-19 patients who suffer unfavourable outcomes are more likely to be hypertensives and other cardiovascular comorbidities. Hypertension is a common non-communicable condition. On a prescription, ACEI, ARB, Calcium channel blockers, and Beta blockers are frequently used to treat it. Most of the hypertensive patients with other comorbidities like heart failure, coronary artery disease, and renal illness are prescribed ACE inhibitors and ARBs. Because it is assumed that people who use these medications during the

COVID-19 outbreak have a poor prognosis, both patients and their healthcare providers have expressed a great deal of concern [5,6]. On the other hand, it is well known that quitting these medications suddenly may have a detrimental effect on cardiovascular results. Additionally, there is a lot of debate regarding the advantages of ACE-Is and ARBs, which are supported by biological veracity, animal research, and human trials on individuals with various respiratory infections due to viral etiology. Patients with diabetes or hypertension may have an increased chance of infection with a severe COVID-19 sickness, according to data reported in China during the COVID-19 pandemic. ACE 2, a SARS-Cov2 receptor responsible for binding and cell entry, expression is boosted by the administration of ACEI or ARB in these circumstances. However, following lung injury due to acute infection, elevated ACE2 levels and/or decreased renin-angiotensin system (RAS) activation may be protective [7,8]. This study aims to shed light on hypertension patients with COVID–19 by analysing the details of both their general characteristics (such as age or gender) and specific clinical entities (Blood pressure, serum electrolytes, co-morbid conditions, antihypertensive drug therapy). It is debatable how ACEI and ARB function when COVID-19 is present. The clinical profile and outcome of COVID-19 infection with different antihypertensives must therefore be investigated. This study's main aim is to evaluate the clinical characteristics and outcomes of COVID patients with and without hypertension.

Materials & Methods

The Institutional Human Ethics Committee approved this study. This cross-sectional study was conducted at the KMCH Institute of Health Sciences and Research in Coimbatore from October 2020 to April 2021. 195 COVID-19 patients of both sexes participated in this trial, 58 of them had hypertension and were using oral antihypertensive medications. All the patient information was kept confidential. The study did not include any COVID-19-positive children aged less than 18 years.

Methodology

Anonymized data from the medical records of all COVID-19 patients, were then entered and analysed using a data collection tool. The cases were divided into hypertensive and non-hypertensive groups based on the patient's medical history at the time of admission, and the variation between the groups was compared. The patient data recorded were clinical profile (symptoms, comorbidities, O2 saturation, plasma glucose, HbA1c, serum electrolytes, hospital stay, systolic and diastolic blood pressure, CORADS score) and treatment outcome (i.e. ICU admissions, severity, death).

Statistical Analysis

The data were evaluated using SPSS software, version 27. Descriptive analysis was performed on the clinical profiles and results of patients with and without hypertension.

Results

A total of 195 COVID patients were analysed, and out of them 58 (29.7%) were hypertensives. The characteristics of hypertensive patients were separately analysed and presented as follows. The Study participants ranged from 18 to 85 years with a mean age of 51.39 years. Less than 7% were below 40 years. 48.6% were between 40 to 60 years. Another 25.6%

were between 61-70 years. The rest 18.9% were above 70 years. (Fig 1) Of the study participants, 63.7% of the hypertensives were males and the rest 36.3% were females. 41.37% of the hypertensives had Diabetes. RTPCR was positive in 93.1% of the hypertensives. 96.6% of the hypertensives had a travel history. All the hypertensives recovered and were discharged. 3.4% had taken one dose of vaccine.

CORADS score was used to classify the severity of Pneumonia. None of the hypertensives had a severity score of 3. 15.35% had a severity score of 2, and 82.8% had a severity score of 1. When the severity score was compared with normotensives, there was no significant difference between both groups. (Table 1). None of the patients needed intensive care. The means of various clinical (blood and physical) parameters were compared between hypertensives and non-hypertensives. The mean age of hypertensives was 58.7 compared to 42.44 among normotensives (P<0.001). There was no significant difference between the groups with respect to SPO2, Plasma Glucose (random), sodium, potassium, chloride, systolic blood pressure and hospital stay. There was a significant difference in diastolic blood pressure. (74.96 Vs 78.45) (Table 2). No significant difference in treatment outcomes with various antihypertensives.

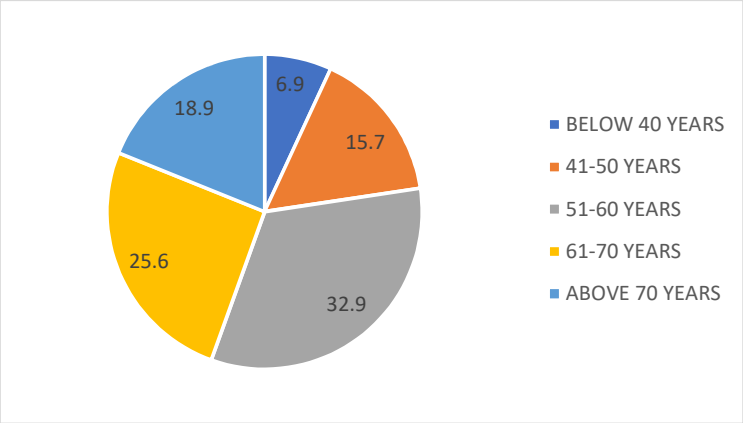


Figure 1. Distribution of study population according to age

Table 1. Distribution of the study population according to various clinical profiles and treatment outcome parameters

Parmeter	Normotensives	Hypertensives
Age(years)	48.24 ±16.18	58.70 ± 12.74***
SpO2(%)	96.07 ±2.33	95.56 ±3.57
Plasma glucose(mg/dl)	147.53 ±64.70	160.67 ±89.50
Sodium(mEq/L)	136 ±4.91	137.10 ±5.50
Potassium(mEq/L)	3.97 ± 0.47	4.04±0.44
Chloride(mEq/L)	96.67 ± 3.58	96.43±3.74

Systolic Blood pressure(mmHg)	118.69±15.66	122.76±14.60
Diastolic blood pressure(mmHg)	74.96±9.86	78.45±10.56*
Hospital stay (Days)	5.66±3.21	5.29±3.23

Data are expressed in Mean ±SD. p value *p<0.05, **p<0.01, ***p<0.001

Table 2. Distribution of the study population according to symptoms, severity & comorbidity

Parameter	**Normotensives (137)**		**Hypertensives (58)**	
	Number	**%**	**Number**	**%**
Fever	117	85.40	48	82.7
Sore throat	120	87.59	50	86.20
Cough	110	80.29	28	48.27
Headache	54	39.4	15	25.86
Loose stools	30	21.89	20	34.48
Loss of taste and smell	95	69.34	52	89.6
Fatigue	48	35.03	29	50.0
Breathlessness	20	14.59	20	34.48
0	1	0.7	1	1.7
1	120	87.6	48	82.8
2	13	9.5	9	15.5
3	3	2.2	0	0
Mild	120	87.59	48	82.75
Moderate	17	12.40	10	17.24
Severe	0	0	0	0
Diabetes	33	24.08	24	41.37
Bronchial asthma	5	3.64	3	5.172
Coronary artery disease	14	10.21	20	34.48
Chronic kidney disease	0	0	2	3.44

Data is expressed in percentage.

Discussion

As a "silent killer," hypertension is a condition whose consequences and severity are not noticed until the disease has progressed. Literature search showed that incidence of arterial hypertension post COVID-19 was assessed to be between 9 and 12%. It has been well observed that hypertension worsens the condition and increases mortality in patients with COVID-19. In our study, patients with hypertension were over 55 years old on average significantly older than patients without the condition [9,10]. We also observed that fever, sore throat, and loss of taste and smell were the most prevalent signs of hypertensive patients infected with COVID -19. In hypertensive patients low to moderate grade fever with minor systemic symptoms were common. The

hypertensives included in this study were commonly treated with ACE inhibitors, Angiotensin receptor blockers and calcium channel blockers. No significant difference was observed in treatment outcome related to drugs. Ang II was reportedly converted by ACE2 into Angiotensin (1–7), which protects lungs and also prevent or decrease lung failure due to acute infection according to certain studies. Their higher risk of severe COVID-19 development may be attributed to the expression of ACE 2. But research has also demonstrated that the ACE2 receptor is the route by which SARS-CoV-2 penetrates human cells [11,12]. Additionally, research has demonstrated that various antihypertensive medications, including ACEI and ARBs, may raise the level of ACE2 expression on the cell surface. Theoretically people with hypertension treated with ACEI or ARBs would become more susceptible [13].

However, research has demonstrated that reducing angiotensin II levels can lessen the immediate lung harm caused by the deletion of ACE2 following SARS - CoV infection. As a result, the lung damage caused by SARS-CoV-2 may be partially mitigated by the elevated expression of ACE2 caused by therapy with ACEI/ARBs. [14,15]. Since there was no discernible difference in our study between the normotensives and hypertensive groups on ACEI/ARBs, it can be assumed, that COVID-19-infected hypertension patients can continue with ACEI/ARBs [16,17].

According to certain studies, SARS-CoV-2 may function similarly to SARS-CoV in primarily affecting lymphocytes, particularly T cells. Through the respiratory mucosa, the virus multiplies and affects other cells [18]. Additionally, it results in a cytokine storm and a string of immunological reactions that change immune cells mainly lymphocytes and white blood cells. T cells produce the crucial lymphokine IL-6. It directly mediates immune system reactions and plays a crucial role in prognosis of viral infection. [19,20]. We found that the serum electrolyte levels (Na, K, Cl) were not statistically different between individuals with and without hypertension.At the same time, chronic hypertension can readily harm target organs like the kidneys, heart, and brain. Because of this, the vital organs of individuals with hypertension lose their ability to compensate during the systemic inflammatory response and cannot respond fast to the inflammatory storm [21,22]. However, several studies have discovered that the primary causes of death for COVID-19 individuals are old age and comorbidities. More than 60 years was the average age of hypertensive patients. The identified risk may be connected to hypertension, which, together with other comorbidities, influences mortality in older persons. [23]. We need age-adjusted studies to identify the clinical predictors of severe and fatal COVID-19.

Conclusion

The outcome of the study showed difference in the treatment outcome in hypertensives compared to normotensives is not significant. p values without statistical significance might not be a reliable indicator of the condition of the entire population. A larger sample size is thus necessary.

Ethics approval, Consent to participate, Consent to publish, Availability of data and material, Code availability

Not applicable

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