Assessment of Hospitalized Patient with 2019 Novel Coronavirus-Infected Pneumonia Associated with Hypertension in Tertiary Care Hospital - A Cross Sectional Study

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Abstract

Background: The pandemic, caused by the severe acute respiratory syndrome coronavirus 2 (SARS-CoV-2) which poses unprecedented challenges to health-care systems around the world, another one is hypertension which is growing rapidly to epidemic levels in the developing countries, that's why described by some clinicians as a 'silent killer'.

Objective: To study the prevalence of hypertension on disease progression and prognosis in patients with SARS-COV-2 positive adults and also assess the co relation between SARS-COV-2 positive adults with hypertension in tertiary care hospital.

Methodology: A Hospital based, cross sectional, observational study was conducted among the 208 SARS-COV-2 positive adults in tertiary care hospital. A comparison between patients, admitted in Non-ICU and in ICU for treatment and management. Their demographic data, clinical manifestations, were collected and analyzed.

Result: In our study 65 SARS-COV-2 positive subjects were found to be hypertensive with the prevalence of 31.3%. Where; new cases of hypertension were found to be with prevalence of 16 (24.6.%). Whereas, 69.4% of hypertensive subjects were on medication still having raised blood pressure ($P < 0.05$). However, failed to show that hypertension was an independent risk factor for COVID-19 mortality or severity ($P > 0.05$).

Recommendation: It is necessary to create additional attention, awareness, change attitude so that they quit and avoid modifiable risk factors associated with hypertension and SARS-COV-2 infection and prevent worsening of their condition which leads to severe pneumonia, excessive inflammatory reactions, organ and tissue damage, and deterioration of the disease.

Keywords: Hypertension, SARS-COV-2, 2019 novel coronavirus disease

The coronavirus disease 2019 (COVID-19) pandemic, caused by the severe acute respiratory syndrome coronavirus 2 (SARS-CoV-2) [1] which poses unprecedented challenges to health-care systems around the world. There have been more than 240 million confirmed cases of COVID-19, including 5 million deaths worldwide till 21st October 2021 [2].

Over the past months, several reports have shown that hypertension can be associated with the risk of SARS-CoV-2 infection as well as to the development of the worse prognosis of COVID-19 [3,4] Nevertheless, these assumptions have been challenged and the independent role of hypertension on the risk of infection and the worse outcome of COVID-19 has been mitigated and under debate. An increased risk of SARS-Cov-2 infection and worse outcomes of COVID-19, leads to higher risk of hospitalization, access to intensive care units and mortality, have been shown in the elderly and in individuals affected by comorbidities other than hypertension such as diabetes, previous cardiovascular (CV) and cerebrovascular diseases, obesity, and chronic pulmonary diseases [5,6,7]

To understand whether hypertension is a risk factor affecting the progress and prognosis of COVID-19, this study included cases of COVID-19 patients admitted to Amaltas Hospital after the outbreak in 2020- 21. Their demographic data, clinical manifestations were collected and analyzed. In this review researcher wants to describe the epidemiological and clinical characteristics of NCIP among hypertensive patients.

Material & Methods

Ethical Consideration

This study was approved by the Institutional Ethical and Research committee of Amaltas Institute of Medical Sciences, Dewas. The investigators applied ethical principles that protected the

Background

participants from any harm or risk during research. Anonymity and confidentiality of study subjects were ensured throughout the study.

The investigator ensured anonymity by using numbers or codes and reported data for the entire group. All consecutive patients with confirmed NCIP (Novel Coronavirus- Infected Pneumonia) admitted to Amaltas Hospital.

Study Period

The study was carried out from 5th of January 2021 to 18st April 2021.

Targeted Population, Settings and Instruments for getting the Information

The study was conducted at Amaltas Institute of Medical Sciences, Dewas in Department of Community Medicine, located in Dewas District, the endemic areas of NCIP, is one of the tertiary teaching hospitals and is responsible for the treatments for NCIP assigned by the government. A hospital based cross sectional study conducted among all consecutive patients with confirmed NCIP (Novel Coronavirus- Infected Pneumonia) admitted to Amaltas Hospital of Dewas city enrolled in this study according to World Health Organization interim guidance.8

In the study; investigator approached multipurpose social worker (MSW) of department of community medicine who informed and motivated the study subjects to participate in the study. All the participants were explained about the purpose of the study and were ensured strict confidentiality, and then informed verbal consent was taken from each participant before the interview and examination.

The data collection tool used was structured pro-forma used as a measuring tool for collection of data. Which is mainly a close-ended multiple-choice question with few open-ended questions. Proforma is predesigned and pretested containing

questions related to the information on socio demographic status such as age, sex, marital status, religion and history of hypertension was interviewed along with their blood pressure readings.

Inclusion Criteria: All individuals of 20 years and above whose are able to give verbal concerned were included.

Exclusion Criteria: All individuals below 20 years and those who are were very critically ill were excluded. Even those individuals who were not interested and not given consent.

Data Collection

The medical records of patients were analyzed by the research team of the Department of community medicine, Amaltas Hospital, Dewas. The data were reviewed by a trained team of researchers. Information recorded included demographic data, medical history and exposure history. The date of disease onset was defined as the day when the symptom was noticed.

In this study, we collected the clinical data of 208 patients diagnosed with COVID-19 at Amaltas Hospital. According to the World Health Organization's temporary guidelines 8, all the patients enrolled in this study were diagnosed with COVID-19.

In the first part of the study, all patients were divided into two groups according to mode of admission whether the study subjects in Non-ICU or in ICU. The second part of the study includes SARS Covid-19 patients with hypertension and without hypertension, then Covid-19 positive patients future dived according to gender to

Results

find out the hypertension history and new onset in between pandemics. We monitored all patients in our study and recorded the entire course of the disease and the final clinical outcome of each subject.

Data Analysis

A variable file was created on MS Office Excel 2010. Descriptive statistics were performed for each question. The responses were classified into two categorical responses yes and no. The rate of correct responses for each question was then described.

Statistical Analysis

All statistical analyses were performed using SPSS (Statistical Package for the Social Sciences) trial version 13.0 software (SPSS Inc). Categorical variables were described as frequency rates and percentages. Proportions for categorical variables were compared using the χ^2 test, although the Fisher exact test was used when the data were limited. For unadjusted comparisons, a 2-sided α of less than .05 was considered statistically significant. The analyses have not been adjusted for multiple comparisons and, given the potential for type I error, the findings should be interpreted as exploratory and descriptive.

Definition

All patients with COVID-19 met the following criteria: (1) epidemic history, (2) fever or other respiratory symptoms, (3) abnormal CT imaging of typical viral pneumonia, and (4) positive SARS-COV-2 RNA by RT-PCR.

Table 1: Baseline characteristics of patients infected with SARS-CoV-2

Variables Age	Non-ICU Covid-19 Patients (n) (%)	ICU Covid-19 Patients (n) (%)	Total Population (n) (%)	Chi Square/ Fisher's	P-Value
≥ 18 < 25 years	76 47.8	04 8.2	80 38.5		0.0001**
≥ 25 < 50 years	64 40.3	28 57.1	92 44.2	4.33	0.0374*

≥ 50 years	19	11.9	17 / 34.7	36 / 17.3	13.53	0.0002**
Sex						
Male	75	82.4	16 / 32.7	91 / 43.7	3.20	0.073
Female	84	71.8	33 / 67.3	117 / 56.3		
Marital Status						
Married	132	83.0	28 / 57.1	160 / 76.8	14.12	0.0002**
Single	20	12.6	02 / 04.1	22 / 10.6		0.11
Widow/Widower	07	4.4	19 / 38.8	26 / 12.6		0.0001**
Religion						
Hindu	107	67.3	28 / 57.1	135 / 64.9	1.69	0.192
Islam	48	30.2	20 / 40.8	68 / 32.7	1.92	0.165
Sikhism	04	02.5	01 / 02.1	05 / 02.4		1.000

**: Extremely significant; *: significant

Table 1 shows that the present study was conducted on 208 SARS-CoV-2 patients. Where Non-ICU were 159 (77.2 %) patients, and ICU were having 49 (23.8 %) patients. According to Age ≥ 18 < 25 years, majority of study subjects were admitted in Non-ICU wards with ($P < 0.01$), followed by ≥ 25 < 50 years majority of study subjects were in ICU with ($P < 0.05$), and ≥ 50 years were mainly admitted in ICU ($P < 0.01$) respectively. According to gender; majority of male patients (82.4 %) were admitted in non-ICU, whereas female admitted on higher side in ICU compared to males with non-significant ($P < 0.05$) in the study respectively.

In present study according to marital status; majority of participants (76.8%) were married followed by widow/ widower (12.6 %) and single were (10.6%) respectively. According to marital status, married patients were prone to get infected and were admitted in Non-ICU with ($P < 0.01$), followed by widow/ widower majority of study subjects were admitted in ICU care with ($P < 0.01$) for treatment and management respectively. According to Religion, majority of 135 (64.9%) participants were practicing as Hindu religion followed by Islam and Sikhism i.e. 32.7 % and 2.4 % respectively in present study.

Table 2: Characteristic of study population according to hypertension

Variables	Male (n) (%)	Female (n) (%)	Total Population (n) (%)	Chi Square	P-Value
Normotensive Subjects	67 / 73.6	76 / 65.0	143 / 68.7	1.79	0.180
Hypertensive Subjects	24 / 26.4	41 / 35.0	65 / 31.3		
Study Population	91 / 100.0	117 / 100.0	208 / 100.0		

Table 2: Shows that the present study was conducted on 208 SARS-CoV-2 patients. Where, non-hypertensive patients were 143 (68.7 %) compared to hypertensive patients (31.3%). According to gender; female patients were (35.0%) more prevalent as compared to male patient ($P > 0.05$) in the present study respectively.

Table 3: Distribution of hypertensive subjects according to history of hypertension and pattern of medication

Variables	Male COVID-19 patient (n) (%)	Female Covid-19 Patient (n) (%)	Total Covid-19 patient (n) (%)	Chi Square/ Fisher's Exact	P-Value
H/o Hypertension					
Yes	11 45.8	38 92.7	49 75.4		0.0001**
No	13 54.2	03 07.3	16 24.6		
On Medication					
Normotensive	02 18.2	26 68.4	15 30.6		
Hypertensive	09 81.8	12 31.6	34 69.4		0.0049*
Total	11 100.0	38 100.0	49 100.0		

Table 3 represents the data according to history of hypertension among 65 hypertensive subjects; where, 49 (75.4%) subjects were previously diagnosed as hypertensive and all were on anti-hypertensive medication. There were additional 16 (24.6%) newly diagnosed subjects who did not know they have hypertension. According to gender; 24 (36.9%) males were found to be hypertensive and out of which previously diagnosed hypertensive were 11 (45.8%) and newly diagnosed were 13 (54.2%). Whereas, 41 (63.1%) females were found to be hypertensive and out of which previously diagnosed were 38 (92.7%) and newly diagnosed were 03 (07.3%) with statistically significant (P < 0.01). Whereas Subject with SARS COvid-19 positive; who were on anti-hypertensive medication; 34 (69.4%) were still have hypertension while 15 (30.6%) subjects were having normal blood pressure (P < 0.05) in the study it may be due to anxiety of infection

for which they came for future treatment respectively.

Discussion

In our study, age of the covid-19 patient was $\geq 18 < 25$ years, and the prevalence of hypertension was 31.3%. Similar study was conducted in China by Huang S et al (2022) [9]; among covid-19 patients where the median age was 62 years, and the prevalence rate of hypertension was 36.5%. similar multicenter study showed that 30% of COVID-19 patients with a median age of 56 had previously coexisting hypertension in China by Zhou F et al (2019) [10]; another large sample of 1099 COVID-19 cases (with a median age of 47) had a prevalence of hypertension of 15% conducted in China by Guan W et al (2019) [11]. The higher prevalence of hypertension in our study may be due to higher in younger age group compared to other studies. In general, there is not sufficient evidence to show that people with high blood pressure are more likely to be

infected with COVID-19 than those without hypertension.

Our study revealed that hypertensive COVID-19 patients tend to show higher mortality and severity i.e.; ≥ 50 years were mainly admitted in ICU (P < 0.01) respectively. Previous clinical studies on SARS and Middle East respiratory syndrome showed that hypertension is a risk factor for increased mortality in infected patients in older age [12, 13].

Similar to our study some studies conducted in Kerala by Lakshman A et al (2014); among 179 Male Bus drivers, aged 21 – 60 years and observed 41.3% prevalence of hypertension in the study [14]. In (2014), another similar cross-sectional descriptive study conducted at Sokoto, Nigeria; by Awosan K et al; among 390 traders, found (29.1%) prevalence of hypertension [15]. Similarly, in (2015) population based cross sectional study conducted in Kang, Botswana by Tshltenge S and Mabuza L; among 161 adult resident aged ≥ 20 years, found the prevalence of hypertension to be 32% [16]. In (2015), same year another study conducted in rural area of Jharkhand by V. Kashyap et al; among 500 study subjects with age groups ≥ 20 years, found the prevalence of hypertension to be 19.8% [17]. Recently, in (2016) a community based cross sectional study conducted in rural area of Kurnool by A. Sreedevi et al; among 233 individuals with aged ≥ 35 years, observed 42.42% prevalence of hypertension [18].

According to marital status, similar study was conducted by JIW Njeru (2014); found 50% of the participants were separated, divorced or widowed followed by 40% were married and 19% were being single in the study respectively [19].

Whereas according to religious practice similar study was conducted (2015) by Kashyap V et al; in rural area of Jharkhand, found that nearly half of the participant in their study was practicing Hindu religion followed by Sarna and Islam i.e. 27.4% and 25.6% and very few were Christians i.e.

2.2% respectively [17]. Followed by another study which was conducted in Sokoto, Nigeria (2014) by Awosan K J et al; found that most of the participants were practicing Christianity as religion 66.1% followed by Islam 33.9% respectively [15].

Similar study conducted in Jeddah by Ibrahim N et al (2008); among 1476 school teachers; found that less than one third (31.8%) of teachers were normotensive, whereas the overall prevalence of HTN was 25.2 %. Among all diagnosed hypertensive cases only less than of third (30.4%) were aware of being hypertensive. Among those aware of the problem, 69 cases had controlled HTN (normotensive) in the study [20].

In (2012), another similar type of study conducted in Bangalore by Madhukumar S et al; among 1501 subjects aged ≥ 15 years, found that the prevalence of hypertension was (8.06%), out of which (86.0%) were aware of their disease. Only (65.4%) were taking regular treatment and (72.0%) had their BP under control. Whereas, (14.0%) were new cases detected as hypertensive during the study [21].

Similarly, another cross-sectional study conducted in Kathmandu, Nepal by Chataut J et al (2012); found overall prevalence of hypertension was 22.4% (males: 32.7% and female: 15.3%) where almost 40% of hypertensive did not know about their status [22].

Conclusion & recommendations

The prevalence of hypertension in Covid-19 patients was 31.3%. We found that 24.6% subjects didn't know that they were having hypertension. Whereas, among previously diagnosed; 75.4% of hypertensive subjects were on regular medication and still having raised blood pressure in our study which may leads to other co-morbidities. It is necessary to create awareness, change attitude of people so that they quit and avoid modifiable risk factors associated with hypertension.

Limitation

The study was hospital based and conducted under cross sectional design; this was the most feasible method to determine the availability of study subjects in time bound analysis. There were majority of cases which refused to join the study due to multiple factors and panic situation due to pandemic. Case control or prospective cohort studies were better for measurements and to identify relationship between SARS Cov-19 infection and hypertension and its associated risk factors.

Acknowledgements

References

1. Blumenthal D, Fowler EJ, Abrams M, Collins SR. Covid-19—implications for the health care system. N Engl J Med. 2020;383(15):1483–2148.
2. World Health Organization. WHO Coronavirus (COVID-19) dashboard. https://covid19.who.int. Accessed 21 Oct 2021.
3. Iaccarino G, Grassi G, Borghi C, Ferri C, Salvetti M, Volpe M, SARSRAS Investigators. Age and multimorbidity predict death among COVID-19 patients: results of the SARS-RAS Study of the Italian Society of hypertension. Hypertension. 2020; 76:366–72.
4. Mancusi C, Grassi G, Borghi C, Carugo S, Fallo F, Ferri C, Giannattasio C, Grassi D, Letizia C, Minuz P, et al, SARS-RAS Investigators. Determinants of healing among patients with coronavirus disease 2019: the results of the SARS-RAS study of the Italian Society of hypertension. J Hypertens. 2021; 39:376–80.
5. Vincent JL, Taccone FS. Understanding pathways to death in patients with COVID-19. Lancet Respir Med. 2020;8:430–2.
6. Deng G, Yin M, Chen X, Zeng F. Clinical determinants for fatality of 44,672 patients with COVID-19. Crit Care. 2020; 24:179.
7. Docherty AB, Harrison EM, Green CA, Hardwick HE, Pius R, Norman L, Holden KA, Read JM, Dondelinger F, Carson G, et al, ISARIC4C investigators. Features of 20 133 UK patients in hospital with covid-19 using the ISARIC WHO clinical characterisation protocol: prospective observational cohort study. BMJ. 2020;369:m1985.
8. World Health Organization Clinical management of severe acute respiratory infection when novel coronavirus (nCoV) infection is suspected: interim guidance. Published January 28, 2020. Accessed January 31, 2020. https://www.who.int/publications-detail/clinical-management-of-severe-acute-respiratory-infection-when-novel-coronavirus-(ncov)-infection-is-suspected
9. Huang S, Wang J, Liu F, Liu J, Cao G, Yang C et al. COVID-19 patients with hypertension have more severe disease: a multicenter retrospective observational study [Internet]. https://www.ncbi.nlm.nih.gov/pmc/articles/PMC7261650/. 2022. Available from: http://10.1038/s41440-020-0485-2
10. Zhou F, Yu T, Du R, Fan G, Liu Y, Liu Z et al. Clinical course and risk factors for mortality of adult inpatients with COVID-19 in Wuhan, China: a retrospective cohort study. The Lancet. 2020;395(10229):1054-1062.
11. Guan W, Ni Z, Hu Y, Liang W, Ou C, He J et al. Clinical Characteristics of Coronavirus Disease 2019 in China. New England Journal of Medicine. 2020;382(18):1708-1720.
12. Morra M, Van Thanh L, Kamel M, Ghazy A, Altibi A, Dat L et al. Clinical outcomes of current medical approaches for Middle East respiratory syndrome: A systematic review and

meta-analysis. Reviews in Medical Virology. 2018;28(3):e1977.

13. Matsuyama R, Nishiura H, Kutsuna S, Hayakawa K, Ohmagari N. Clinical determinants of the severity of Middle East respiratory syndrome (MERS): a systematic review and meta-analysis. BMC Public Health. 2016;16(1).

14. Lakshman A, Manikath N, Rahim A, Anilakumari V. Prevalence and Risk Factors of Hypertension among Male Occupational Bus Drivers in North Kerala, South India: A Cross-Sectional Study. ISRN Preventive Medicine. 2014; 2014:1-9. Available from: http://www.hindawi.com/journals/isrn/2014/318532/

15. Awosan, K, Ibrahim, M, Essien, E, Yusuf, A, Okolo, A. Dietary pattern, lifestyle, nutrition status and prevalence of hypertension among traders in Sokoto Central market, Sokoto, Nigeria. International Journal of Nutrition and Metabolism. 2014; 6(1):9-17. Available from: http://www.academic journals.org/journal /IJNAM/article-abstract/F321 BD842236

16. Tshitenge S, Mabuza L. A survey of risk factors associated with hypertension in the adult population of Kang, Kgalagadi North, Botswana. South African Family Practice. 2015; 57(3):177-182. Available from: http://www.tandfonline.com/doi/pdf/10.1080/20 786190. 2014.976963

17. Kashyap V, Kumar C, Haider S, Singh S, Sagar V. Prevalence of Hypertension and Its Association with Selected Socio-Demographic Factors in a Rural Area of Jharkhand. 2015. Available from: http://www.iosrjournals.org/iosr-jdms/papers/Vol14-issue4/Version 4/A014 440106.pdf

18. Sreedevi A, Rao G, Divya B, Prasanthi B, lakshmi B, Rani G et al. Study on prevalence and risk factors of hypertension in rural field practice areas of Kurnool medical college, Kurnool. Int J Community Med Public Health. 2016; 506-511. Available from: http:// www.scopemed.org/? mno=210303

19. Njeru J. Prevalence and Associated Risk Factors for Hypertension among HIV Positive Patients Attending Comprehensive Care Centre at Thika District Hospital, Kenya, 2008 [Internet]. 2014 [cited 17 May 2016]. Available from: http://ir.jkuat.ac.ke/handle/123456789/1357

20. Ibrahim N, Hijari N, Al- Bar A. Prevalence and Determinants of Pre-hypertension and Hypertension among Preparatory and Secondary School Teachers in Jeddah. 1st ed. Jeddah KSA: J Egypt Public Health Assoc; 2008. Available from: https://www. researchgate.net/profile/Prof_Nahla_Ibrahim/publi-cation/24216396_Prevalence_and_Determinants_of_Prehyperte -nsion_and_Hypertension_among_Preparatory_and_Secondary_School_Teachers in Jeddah/links/0c96052406ef0c1a3e000000.pdf

21. Madhukumar S, Gaikwad V, Sudeepa D. An Epidemiological Study of Hypertension and Its Risk Factors in Rural Population of Bangalore Rural District. Al Ameen J Med Sci. 2012. Available from: http://ajms.alameen medical. org/Article PDFs%5CAJMS%20V5.N3.2012%20p%20264-270. Pdf

22. Chataut J, Adhikari R, Sinha N. Prevalence and Risk Factors for Hypertension in Adults Living in Central Development Region of Nepal. Kathmandu University Medical Journal. 2012; 9(1). Available from: http://www.ncbi.nlm.nih.gov/pubmed/22610802Last Five Years only, Vancouver Style, PubMed reference preferred, see IJCH published articles, web-links url mention Accessed on 20/01/2022