

Co-morbidities and Complications in COVID-19 Recovered Patients in Bhilwara District, Rajasthan, India: A Descriptive Study

MAHESH KUMAR CHOUDARY¹, SHALINI JAIN², SURENDRA MEENA³, DAULAT MEENA⁴, ARUN GOUR⁵, SHALABH SHARMA⁶



ABSTRACT

Introduction: Coronavirus Disease-19 (COVID-19) infection is associated with high rates of pulmonary and extrapulmonary complications that may continue to incur morbidity, disability and delayed mortality in survivors. These include hyperglycaemia, cardiac injury, acute ischaemic or haemorrhagic stroke, neurological deficits, acute kidney injury and liver injury.

Aim: To describe symptoms and complications being faced by COVID-19 recovered patients, as well their socio-demographic profile and co-morbidities.

Materials and Methods: This was a cross-sectional descriptive study conducted for the period of 12 months from April 2020 to March 2021. Out of nearly 10,000 recovered COVID-19 patients, 1000 patients were selected randomly. The patients were categorised gender-wise (male and female) and locality-wise (urban and rural) and an attempt was made to find if any

significant difference exists in the symptoms and complications based on above categorisation. The test used for this purpose was Chi-square test and Fisher's-exact test.

Results: Mean age of participants was 50.2±15.7 years and 43.8% had co-morbidities. Common complications included hyperglycaemia (n=28), acute kidney injury (n=8), acute liver injury (n=5), cardiovascular accident and stroke (n=5), septicaemia (n=8), ischaemic heart disease (n=7), deep vein thrombosis (n=2), cytokine release syndrome (n=10) and post COVID-19 fibrosis (n=3). For septicaemia, a statistically significant difference (p<0.001) was found between urban and rural areas whereas no significant difference in post COVID-19 complications between males and females was observed.

Conclusion: The most common co-morbidity was diabetes mellitus and most common complication reported was hyperglycaemia.

Keywords: Coronavirus disease-19, Diabetes, Hypertension, Post COVID fibrosis, Septicaemia

INTRODUCTION

The outbreak of novel COVID-19 was initially noticed in a seafood market of Wuhan city in Hubei Province of China in Mid-December 2019, and it was declared as a Public Health Emergency of International Concern (PHEIC) on 30th January 2020 by World Health Organisation (WHO) [1]. It was found that, in general, COVID-19 is less severe and fatal than Severe Acute Respiratory Syndrome (SARS). However, some patients, especially the elderly with co-morbidities were prone to develop more severe symptoms and required urgent medical interventions [1,2]. For patients diagnosed with COVID-19, surviving the disease may be just the first battle among many on the long road to recovery. Although there was not sufficient data to definitively establish and characterise a post COVID-19 syndrome; potential long-term consequences can be inferred from merging data as well as prior experiences with other serious respiratory illnesses and the broader Post Intensive Care Syndrome (PICS), a constellation of physical, cognitive and psychological disabilities that can develop in those surviving critical illness [3].

Patients with severe manifestations of COVID-19 often progress to Acute Respiratory Distress Syndrome (ARDS) and require mechanical ventilation. ARDS may cause permanent scarring of the lung tissue, resulting in respiratory problems that persist long after recovery [4]. COVID-19 infection is also associated with many extrapulmonary complications that may lead to morbidity, disability and delayed mortality in survivors. These include cardiac injury [5], acute ischaemic or haemorrhagic stroke [6], neurological deficits [7], acute kidney injury including the need for dialysis and liver injury [8]. The thromboembolic complications of COVID-19, such

as pulmonary embolism, stroke and other micro-infarctions, can cause a wide range of permanent organ damage. Independent of ARDS, severe pneumonia has been associated with increased risk of incident heart disease both in the immediate aftermath of the infection and in later years [9,10]. Keeping all these in mind, a need to study the COVID-19 disease in Bhilwara District of Rajasthan state has been felt. Aim of this study was to describe symptoms and complications being faced by COVID-19 recovered patients, as well their socio-demographic profile and co-morbidities has also been studied.

MATERIALS AND METHODS

The present study was a cross-sectional study in which 1000 COVID-19 recovered patients from April 2020 to March 2021 in the Bhilwara District was included. The participants were selected during above mentioned period by simple random sampling method using sampling frame of 10,000 COVID-19 recovered patients. Authors prepared sampling frame of the patients from the data available with RVRS Medical College, Bhilwara, Rajasthan. State level reporting of the COVID-19 cases is done by the department being the nodal unit for the same.

Ethical issue: No intervention was performed on the participants. Verbal consent was taken during telephonic interview and written consent was taken from the participants who were called for investigations.

Inclusion criteria: All Reverse Transcriptase-Polymerase Chain Reaction (RT-PCR) confirmed COVID-19 patients either admitted in wards or Intensive Care Unit (ICU) of dedicated COVID-19 Inpatient

Department (IPD) or patients who were tested positive but not admitted and gave verbal consent were included in the study.

Exclusion criteria: All RT-PCR confirmed COVID-19 patients who did not give verbal consent were excluded from the study.

Sample size calculation: A pilot study was conducted on 50 COVID-19 recovered patients to calculate sample size and for refinement of questionnaire. It was found in pilot study that, proportion of complications was nearly about 40%, so taken 'p'=40%. Type-1 error 'α' is taken 5% to ensure 95% confidence and absolute error 'd' is minimised by taking 1%.

The formula used for sample size calculation is:

$$n = \frac{z^2_{1-\alpha/2} p(1-p)}{d^2}$$

Where,

$z^2_{1-\alpha/2}$ is standard normal variate at 5% level of significance.

'p' is expected proportion in population.

'd' is absolute error.

Calculated minimum sample size was 922. It was rounded-off to 1000. All the patients who gave verbal consent were interviewed telephonically with pre-prepared semi-structured questionnaire by team of general physicians. After interview, cases were selected depending on need for examination and investigation and were called to hospital post COVID-19 Outpatient Department (OPD). Then they were examined and investigated for the symptoms and complications developed by them after recovery from COVID-19. The collected data were summarised and tabulated in suitable manner that was useful for further statistical and mathematical treatment.

STATISTICAL ANALYSIS

The data was entered in MS Excel spreadsheet and analysis was done using same software. Categorical variables are presented in number and percentage. Chi-square test was applied for finding significance of association. Fisher's-exact test had been applied for frequencies having values 0. A p-value <0.05 was considered to be statistically significant.

RESULTS

The mean age of patients was 50.2±15.7 years. Most of the patients (44.1%) were in the age group of 41-60 years. Very less patients (2.5%) were there in age group 1-20 years and 2.1% patients in the age group 81-100 years [Table/Fig-1].

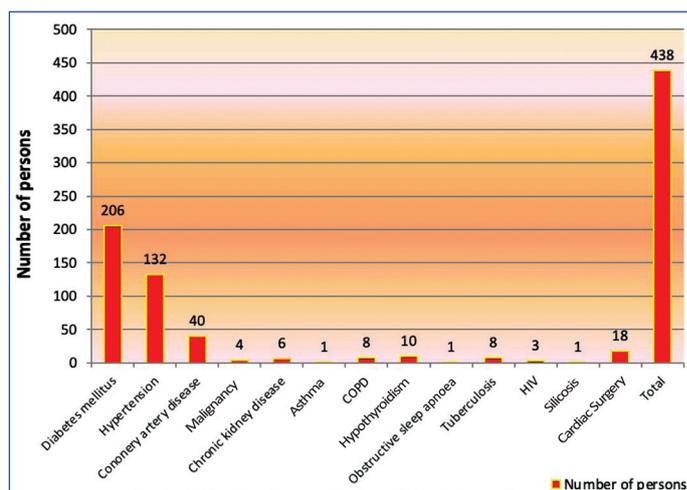
Parameters		Number of patients (n=1000)	Percentage
Age group (in years)	1-20	25	2.5
	21-40	264	26.4
	41-60	441	44.1
	61-80	249	24.9
	81-100	21	2.1
Gender	Females	292	29.2
	Males	708	70.8
Locality	Urban	798	79.8
	Rural	202	20.2
Status of symptoms during COVID-19 disease	Asymptomatic	12	1.2
	Symptomatic	988	98.8

[Table/Fig-1]: Socio-demographic profile of post COVID-19 patients.

Males were predominantly affected (70.8%). Urban preponderance was observed (79.8%). Only 1.2% patients were found asymptomatic while 98.8% were symptomatic.

[Table/Fig-2] represents that 43.8% patients had co-morbidities before diagnosis of COVID-19. The most common co-morbidities

were diabetes mellitus and hypertension, present in 20.6% and 13.2% patients, respectively.



[Table/Fig-2]: Co-morbidities in post COVID-19 patients (before diagnosis). COPD: Chronic obstructive pulmonary disease; HIV: Human immunodeficiency virus

It was observed from [Table/Fig-3] that after 15 days of recovery from COVID-19 disease, weakness/myalgia was the most common complaint present in 41.6% patients. Moreover, 28.8% patients reported with cough, 19.2% patients reported with difficulty in breathing.

Symptoms	Gender			Total	Locality		
	Male n=708 (%)	Female n=292 (%)	p-value		Urban n=798 (%)	Rural n=202 (%)	p-value
Cough	200 (28.24)	88 (30.13)	0.548	288	208 (26.06)	80 (39.60)	<0.001
Dyspnoea	136 (19.20)	56 (19.17)	0.990	192	135 (16.91)	57 (28.21)	<0.001
Fever	13 (1.83)	5 (1.71)	0.893	18	13 (1.62)	5 (2.47)	0.419
Weakness	294 (41.52)	122 (41.78)	0.940	416	308 (38.59)	108 (53.46)	<0.001
Mental illness	8 (1.12)	4 (1.36)	0.751#	12	10 (1.25)	2 (0.99)	0.759#
Pain abdomen	5 (0.70)	3 (1.02)	0.604#	8	7 (0.87)	1 (0.04)	0.586#
Pain in calf muscles	2 (0.28)	0	0.363#	2	2 (0.25)	0	0.476#
Decrease appetite	26 (3.67)	9 (3.08)	0.644	35	29 (3.63)	6 (2.97)	0.646
Hemiparesis	3 (0.42)	1 (0.34)	0.853#	4	1 (0.125)	3 (1.48)	0.006#
Chest pain	8 (1.12)	4 (1.36)	0.751#	12	4 (0.50)	8 (3.96)	<0.001#

[Table/Fig-3]: Post COVID-19 symptoms based on gender and locality respectively. Chi-square test and #Fishers-exact test; A p-value <0.05 is considered to be statistically significant Multiple symptoms

No significant difference was observed in post COVID-19 symptoms between male and female. There was significant difference in symptoms cough, dyspnoea, weakness, hemiparesis and chest pain between urban and rural area patients. Cough, dyspnoea and weakness were found more in urban area while hemiparesis and chest pain in rural area (p<0.05). Rests of the symptoms were non significant in context of locality.

[Table/Fig-4] shows that most common complication developed in the study population was hyperglycaemia in 2.8% patients. There was no significant difference between males and females in context of post COVID-19 complications (p>0.05). It was also observed that septicaemia was found more in rural area as compared to urban area and difference was found statistically significant (p<0.001), while for rest of the post COVID-19 complications there was no significant difference based on locality.

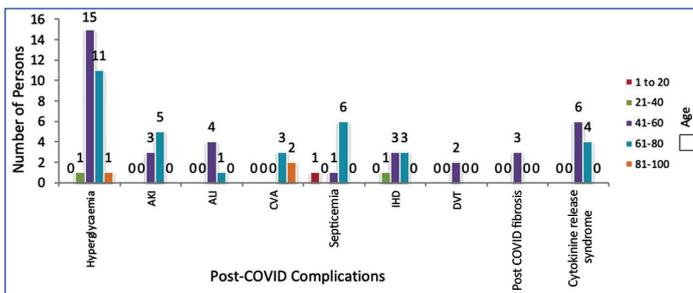
[Table/Fig-5] represents different post COVID-19 complications in different age groups. Major complication which was faced

Complications	Gender			Total	Locality		
	Male n=708 (%)	Female n=292 (%)	p-value		Urban n=798 (%)	Rural n=202 (%)	p-value*
Hyperglycaemia	18 (2.54)	10 (3.42)	0.441	28	20 (2.51)	8 (3.96)	0.263
Acute kidney injury	6 (0.85)	2 (0.68)	0.793 [#]	8	5 (0.63)	3 (1.49)	0.221 [#]
Acute liver injury	4 (0.56)	1 (0.34)	0.650 [#]	5	4 (0.50)	1 (0.50)	0.991 [#]
Cardiovascular accidents	5 (0.71)	0	0.149 [#]	5	5 (0.63)	0	0.259 [#]
Septicaemia	7 (0.99)	1 (0.34)	0.296 [#]	8	2 (0.25)	6 (2.97)	<0.001 [#]
Ischaemia heart disease	5 (0.71)	2 (0.68)	0.97 [#]	7	6 (0.75)	1 (0.50)	0.695 [#]
Deep vein thrombosis	2 (0.28)	0	0.363 [#]	2	2 (0.25)	0	0.446 [#]
Post COVID fibrosis	2 (0.28)	1 (0.34)	0.874 [#]	3	2 (0.25)	1 (0.50)	0.57 [#]
Cytokine release syndrome	8 (1.13)	2 (0.68)	0.520 [#]	10	8 (1.00)	2 (0.99)	0.987 [#]

[Table/Fig-4]: Post COVID-19 complications based on gender and locality respectively.

Chi-square test and [#]Fishers-exact test

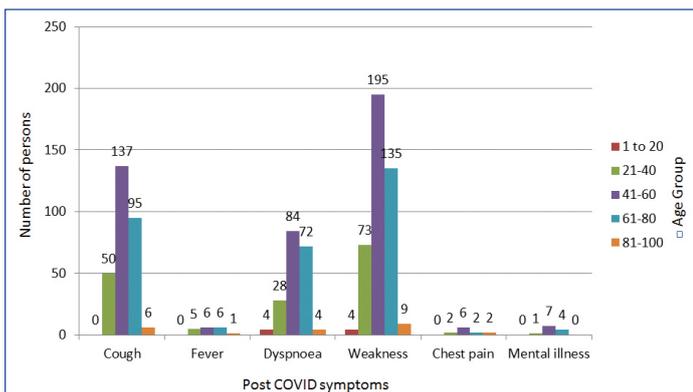
by most of the patients in all age groups except 1-20 years was hyperglycaemia. DVT and post COVID fibrosis was found in age group 41-60 years only. Maximum numbers of complications were seen in patients aged between 61-80 years while only septicaemia had been found in age group 1-20 years.



[Table/Fig-5]: Post COVID-19 complications in different age groups.

AKI: Acute kidney injury; ALI: Acute liver injury; CVA: Cardiovascular accidents; IHD: Ischaemic heart disease; DVT: Deep vein thrombosis

Post COVID-19 symptoms in different age groups have been represented in [Table/Fig-6]. It was observed that maximum people in age group 41-60 had all six symptoms under consideration while patients under age group 1-20 years suffered from dyspnoea and weakness only. Weakness and cough were the symptoms which were found in maximum number of patients whereas fever, chest pain and mental illness were observed in very less number of patients. Out of 1000 patients, chest X-ray was done for 93.6% patients. In chest X-ray, pneumonia was found in 447 patients. Four pregnant women were also there in present study. An 8.3% of patients were admitted in ICU.



[Table/Fig-6]: Post COVID-19 symptoms in different age groups.

DISCUSSION

In the present study, it was observed that COVID-19 disease affects all the age groups which range from 7-94 years. Out of 1000 patients studied, the mean age of participants was 50.2±15.7 years. Most of patients of study group (44.1%) were in the age group of 41-60 years. Huang C et al., Wang D et al., and Chen N et al., also observed similar type of result and they calculated median age of COVID-19 patients as 49.0 years, 56.0 years and 55.5 years, respectively [5,10,11].

It was found that males were predominantly affected (70.8%) and the study done by various authors found similar types of results (58.10%, 66.66%, 73.0%, 73.0%, respectively) [1,5,11,12]. A population-based study from Iceland had shown a lower incidence of Severe Acute Respiratory Syndrome Coronavirus-2 (SARS-CoV-2) infection in children and females compared to adolescents or adults and males [13]. This study also showed that this disease had predominantly urban preponderance (79.8%). The higher incidences in urban population can be explained by more outdoor activities, overcrowding and less social distancing.

In present study, 43.8% patients out of total 1000 had co-morbidities. The most common co-morbidity was diabetes mellitus present in 20.6% and hypertension in 13.2% patients. Similar study was done by Dave M et al., they found co-morbidities were present in 55.9% patients. Among co-morbidities, diabetes mellitus was observed in maximum number of patients (24.3%) followed by hypertension (21%), Coronary Artery Disease (CAD) (2.9%), chronic respiratory illness (1.2%), malignancy (1.1%) and chronic kidney disease (0.7%), respectively [14]. Among COVID-19 cases reported to the China CDC, prevalence of hypertension and CVD were 12.8% and 4.2%, respectively.[9] Moreover, in a case series of 5700 patients from the New York city area [15], prevalence of hypertension, obesity, CHD, heart failure, CKD, and End-Stage Renal Disease (ESRD) were 56.6%, 41.7%, 11.1%, 6.9%, 5.0%, and 3.5%, respectively.

Limitation(s)

As this disease is novel for humanity, very less data is available. This study was performed on preliminary data regarding complications developed after COVID-19 recovery in a small geographical area of Rajasthan state. A multicentre study covering more hospitals and districts can be carried out with more number of patients for further elaboration and generalisation of acquired results.

CONCLUSION(S)

The most common symptoms found was cough, dyspnoea, fever, weakness. Complications found were hyperglyc-aemia, acute kidney injury, acute liver injury, cardiovascular accidents, septicaemia, ischaemia heart disease, deep vein thrombosis, post COVID fibrosis and cytokine release syndrome. The present study also concludes that not much patients fall under severe illness due to COVID-19 disease but most of the patients experienced moderate symptoms and complications during illness as well as after recovery. The children and young people are the groups which are least suffered from the disease even after found COVID-19 positive. Males experienced more symptoms and complications as compared to females. People who reside in urban area got more infected. Finally, it can be concluded that COVID-19 disease is affecting all age groups in different ways. More studies should be continued for more clear and precise information regarding the disease.

REFERENCES

[1] Guan WJ, Ni ZY, Hu Y, Liang WH, Ou CQ, He JX, et al. Clinical characteristics of Coronavirus Disease 2019 in China. N Engl J Med. 2020;382:1708-20.
 [2] Zhou F, Yu T, Du R, Fan G, Liu Y, Liu Z, et al. Clinical course and risk factors for mortality of adult in patients with COVID-19 in Wuhan, China: A retrospective cohort study. Lancet. 2020;395:1054-62.

- [3] Ohtake PJ, Lee AC, Scott JC, Hinman RS, Ali NA, Hinkson CR, et al. Physical impairments associated with post-intensive care syndrome: Systematic review based on the World Health Organization's International Classification of functioning, disability and health framework. *Phys Ther.* 2018;98:631-45.
- [4] Thompson BT, Chambers RC, Liu KD. Acute respiratory distress syndrome. *N Engl J Med.* 2017;377:562-72.
- [5] Huang C, Wang Y, Li X, Ren L, Zhao J, Hu Y, et al. Clinical features of patients infected with 2019 novel coronavirus in Wuhan, China. *Lancet.* 2020;395:497-506.
- [6] Mao L, Jin H, Wang M, Hu Y, Chen S, He Q, et al. Neurologic manifestations of hospitalized patients with Coronavirus Disease 2019 in Wuhan, China. *JAMA Neurol.* 2020;77(6):683-90.
- [7] Helms J, Kremer S, Merdji H, Clere-Jehl R, Schenck M, Kummerlen C, et al. Neurologic features in severe SARS-CoV-2 infection. *N Engl J Med.* 2020;382(23):2268-70.
- [8] Zhang C, Shi L, Wang FS. Liver injury in COVID-19: Management and challenges. *Lancet Gastroenterol Hepatol.* 2020;5:428-30.
- [9] Corrales-Medina VF, Alvarez KN, Weissfeld LA, Angus DC, Chirinos JA, Chang CC, et al. Association between hospitalization for pneumonia and subsequent risk of cardiovascular disease. *JAMA.* 2015;313:264-74.
- [10] Wang D, Hu B, Hu C, Zhu F, Liu X, Zhang J, et al. Clinical characteristics of 138 hospitalized patients with 2019 Novel Coronavirus-Infected Pneumonia in Wuhan, China. *JAMA.* 2020;323(11):1061-69.
- [11] Chen N, Zhou M, Dong X, Qu J, Gong F, Han Y, et al. Epidemiological and clinical characteristics of 99 cases of 2019 novel corona virus pneumonia in Wuhan, China: A descriptive study. *Lancet.* 2020;395(10223):507-13.
- [12] Bhandari S, Bhargava A, Sharma S, Keshwani P, Sharma R, Banerjee S. Clinical profile of COVID-19 infected patients admitted in a tertiary care hospital in north India. *J Assoc Physicians India.* 2020;68(5):13-17.
- [13] Gudbjartsson DF, Helgason A, Jonsson H, Magnusson OT, Melsted P, Gudmundur L, et al. Spread of SARS-CoV-2 in the Icelandic population. *N Engl J Med.* 2020;382:2302-15.
- [14] Dave M, Sareen M, Jain A, Poswal L, Buri A. Study of demographic factors, co morbidities, ICU admission rates, ventilatory rates, cure rates, and case fatality rates of COVID-19 patients admitted in a tertiary care centre of southern Rajasthan. *International Journal of All Research Education and Scientific Methods.* 2021;9(1):511-16.
- [15] Richardson S, Hirsch JS, Narasimhan M, Crawford MJ, McGinn T, Davidson WK, et al. Presenting characteristics, co-morbidities, and outcomes among 5700 patients hospitalized with COVID-19 in the New York City area. *JAMA.* 2020;323:2052-59.

PARTICULARS OF CONTRIBUTORS:

1. Associate Professor, Department of Community Medicine, RVRS Medical College, Bhilwara, Rajasthan, India.
2. Statistician cum Tutor, Department of Community Medicine, RVRS Medical College, Bhilwara, Rajasthan, India.
3. Assistant Professor, Department of Respiratory Medicine, RVRS Medical College, Bhilwara, Rajasthan, India.
4. Associate Professor, Department of General Medicine, RVRS Medical College, Bhilwara, Rajasthan, India.
5. Professor, Department of General Medicine, RVRS Medical College, Bhilwara, Rajasthan, India.
6. Senior Professor, Department of Community Medicine, RVRS Medical College, Bhilwara, Rajasthan, India.

NAME, ADDRESS, E-MAIL ID OF THE CORRESPONDING AUTHOR:

Dr. Daulat Meena,
Associate Professor, Department of General Medicine, RVRS Medical College,
Sindhari Ke Balaji, Sanganer, Bhilwara-311001, Rajasthan, India.
E-mail: drmahesh2711@gmail.com

PLAGIARISM CHECKING METHODS: [Jain H et al.]

- Plagiarism X-checker: Oct 21, 2021
- Manual Googling: Jan 07, 2022
- iThenticate Software: Jan 18, 2022 (14%)

ETYMOLOGY: Author Origin**AUTHOR DECLARATION:**

- Financial or Other Competing Interests: None
- Was Ethics Committee Approval obtained for this study? Yes
- Was informed consent obtained from the subjects involved in the study? Yes
- For any images presented appropriate consent has been obtained from the subjects. NA

Date of Submission: **Oct 19, 2021**
Date of Peer Review: **Nov 22, 2021**
Date of Acceptance: **Jan 08, 2022**
Date of Publishing: **Mar 01, 2022**