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The New Era of Post-Covid Syndrome: A Prospective Study of Post Covid Complications and Its Management

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Abstract

Long covid syndrome is a condition that persists in patients infected with SARS Covid 19 virus which may affect several organ systems. These individuals do not completely recover and symptoms may persist for a long time. There is a high risk of infection in post covid syndrome as the immune system gets suppressed. Cough and dyspnea were the most reported symptoms within the subjects. Patients with comorbidities have a high risk of hospitalization, the most prevalent comorbidity being diabetes mellitus followed by hypertension. Cardiovascular and pulmonary complications were most prevalent among the study subjects. The blood group related evaluation helps in studying the prevalence of long Covid in each blood type and to find the most susceptible group to persisting symptoms of Covid-19. The evaluation of lab parameters helped in understanding the pattern of lab changes in the affected individuals. The changes in the quality of life are topics of discussion, as the persisting symptoms may affect the everyday life of the affected individuals. Using a set of standard questionnaires, the quality of life was calculated qualitatively and conclusions were derived.

Keywords: Hypercoagulable, Hyperinflamattory, Long-Covid, Mucormycosis, Quality of Life, Vaccination.

INTRODUCTION

The World Health Organization (WHO) defined Long-Covid-19 as symptoms that last for at least two months or persists beyond the period of infection and cannot be explained by alternate diagnosis. These symptoms include fatigue, shortness of breath, cognitive dysfunction, and symptoms that affect the functional capacity of individuals with daily living. Symptoms may fluctuate and relapse over the time. Long Covid-19 may adversely affect multiple organ systems, like the kidneys, lungs, pancreas and heart. Also, many patients with Long Covid Syndrome require re-hospitalization especially those with comorbidities, such as cardiovascular disease, Diabetes Mellitus, obesity, cancer and kidney disease. There are data that suggest the evolution of Long-Covid Syndrome is driven by chemicals produced in the body from inflammation called cytokines. Post-acute Covid, or subacute Covid refers to the onset of symptoms, approximately up to 10-12 weeks and chronic Covid refers to onset of symptoms beyond 12 weeks.

The mechanism of post covid complications may vary-immune response, antibody generations, direct effects of the virus, complications of the critical illness, psychosocial factors and post-intensive care syndrome, post-traumatic stress and oxidative stress may be the operative mechanisms. Long-Covid-Syndrome involve hyper inflammatory and hypercoagulable states that affect all organ systems. It is due to maladaptation of Angiotensin Converting Enzyme 2 (ACE 2) pathway.

The pulmonary system is the most commonly involved organ system. Chronic complications, such as chronic cough, fibrotic lung changes, bronchiectasis and pulmonary vascular disease may occur. Persistent lung symptoms are to be expected in many patients with Long Covid Syndrome because the lungs appear to be one of the main organs affected by the virus.

Common cardiac problems may occur in patients with labile heart rate and blood pressure

response to activity. Myocarditis and pericarditis occur as a major complication. In the acute stages, myocardial infarction, cardiac failure, life-threatening arrhythmias and sudden cardiac death have been described.

Post covid effects on the neurological system vary. Post-acute manifestations include fatigue along with serious other symptoms. Patients reported mild to severe headaches; it is assumed that the late-onset headache is due to high levels of cytokine. Concentration and memory impairment sometimes called brain fog was reported after the post-acute sequelae of covid infection. Also cognitive impairment, receptive language, executive function abnormalities, and psychiatric manifestations like anxiety and depression persist for a longer period after covid 19 infection. Peripheral neuropathy, encephalitis, seizures, joint pain, and chest pain are the other conditions that may occur for several months after acute Covid infection.

ACE-2 receptors present in the GI tract result in the entry and multiplication of SARS-CoV-2 and altered parasympathetic functions in covid patients leading to gastric and intestinal motility dysfunction resulting in the manifestation of GI symptoms. Gastrointestinal symptoms such as ageusia, lack of appetite, nausea, vomiting, diarrhoea, abdominal pain, and hepatitis were seen in covid and post covid patients.

AKI(Acute kidney injury) is one of the prominent reasons for mortality and poor outcomes in covid patients. Diffused proximal tubal injury and clusters of coronavirus-like particles were noted in the epithelial cells in an autopsy study conducted in China among 26 victims [1]. Similarly, the neuroendocrine organ thyroid gland was also affected by covid 19 infection. This alteration in the thyroid hormones characterised by low T3 or T4 with unchanged TSH levels was referred to as Euthyroid Sick Syndrome [2].

Supportive therapy is the key stone of post covid syndrome. Fluids electrolytes, nutritional supplements can be mainstay of therapy. Others are solely based on the symptoms. Vaccination is suggested to ease the symptoms of long covid. Psychological symptoms can be treated with behavioral therapy and antidepressants [2]. Breathing exercise and medications can be used for the treatment. Hypoxia is in one of the persistent feature associated with long covid. Oxygen saturation 96% or above can be very promising results. Below the above mentioned saturation needs further investigation and treatment depending on the patient condition. Fatigue is one of the most reported long covid complaint among the patients.

In Covid-19 patients, clinically significant cardiac complications are more common in those with pre-existing cardiovascular disease, but they have also been reported in young patients as well. Prophylactic anticoagulation is administered to most of the hospitalized patients due to increased risk of thromboembolic events.

In the case of neurological complications support should be personalized with the help from the multi-disciplinary healthcare team including general practitioner, nurse, social worker, rehabilitation teams, and occupational therapist.

Low mood, hopelessness, heightened anxiety, and difficulty in sleeping is often manifested in patients after post-acute covid-19. Management measures emphasize on enhancing the patient's well-being, mindfulness, social connection, self-care, peer support, and symptom control [3].

MATERIALS AND METHOD

Aim

To study the impact of Post Covid Syndrome on the health and quality of life of the affected individuals and to analyze the benefits of its management in a tertiary care hospital.

Goals of Study

1. To analyse Post Covid complications.
2. To interpret the changes in lab parameters.
3. To analyse the management of Post Covid complications.
4. To evaluate the role of vaccine in Post Covid complications.
5. To analyse the quality of life of discharged patients after Post Covid Syndrome by telephonic survey using a standard scale – EURO QoL 5D 5L.
6. To study the complications of Post Covid Syndrome in various blood groups.

General Information

A six-month prospective study was carried out by taking details of patients from the medical records and the Mediware system available in the Lourdes's Hospital, Ernakulam from October 2021 to May 2022. A total of 110 study subjects with post covid complications were analyzed. All the patients with Post Covid complications and who met the inclusion and exclusion criteria were selected in the study.

Inclusion Criteria

Patients of all genders above the age group of 18 who were tested positive for corona by ANTIGEN/TrueNat/RT-PCR tests were eligible for the study.

Exclusion Criteria

Patients who were not willing to participate and patients with incomplete data were not included in the study.

Study Methods

The study was done by taking details of patients from the medical records and the Mediware system available in the Lourdes's Hospital, Ernakulam for a period of 6 months. The collected data were verified before entering on the terms of inclusion and exclusion criteria and was collected using specially designed data collection form. The study analyzed Post Covid complications based on each organ system and categorized complications into common, infections and organ system based complications. Lab parameters of post covid patients were also analyzed. Association between different blood groups and Post Covid complications were determined in the selected participants. Vaccination status was obtained from the subjects including type of vaccine and number of doses taken. Association between covid-19 vaccination and Post Covid complications were analyzed. Quality of life of the subjects was analyzed at the time of hospitalization and after discharge.

Statistical Method

The collected data were compiled using Microsoft Excel and were presented using tables and graphs. The data were tabulated, analyzed and compared with relevant studies. Analyses were carried out at 10% level of statistical significance. Calculation of mean, standard deviation, paired t-test and chi square test were done using statistical calculators. The statistical software SPSS was used for analysis of the data.

RESULTS AND DISCUSSION

The subjects who were tested covid - positive before and negative at the time of admission were included in the study. The Covid-19 outbreak has affected gender differently; therefore it is essential to recognize the extent to which Post Covid complications have affected women and men. The association between gender and Post Covid syndrome was determined. A total of 110 patients consisting of 51 females and 59 males were enrolled in the study. From this male gender (53.6%) was found to have higher risk of developing long-term complications than females (46.4%). There are studies which showed males were more prone to post covid complications [4]. This gender-based discrepancy has led to the comparison of these complications in both sexes after age categorization.

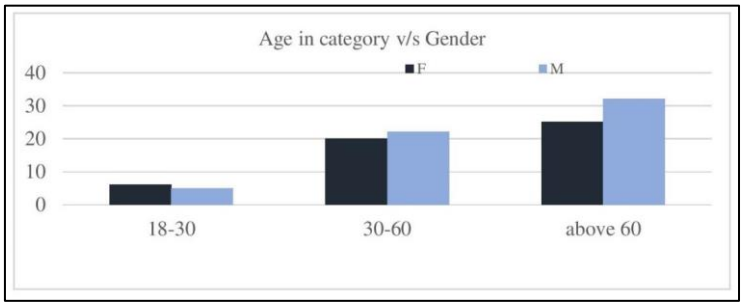

Fig. 1: Distribution of subjects based on Age and Gender

More patients were in the age group of above 60 in both populations, which indicates that aged populations are more prone to Post Covid complications as shown in fig. 1. Most of the respondents in our study were males (53.6%).

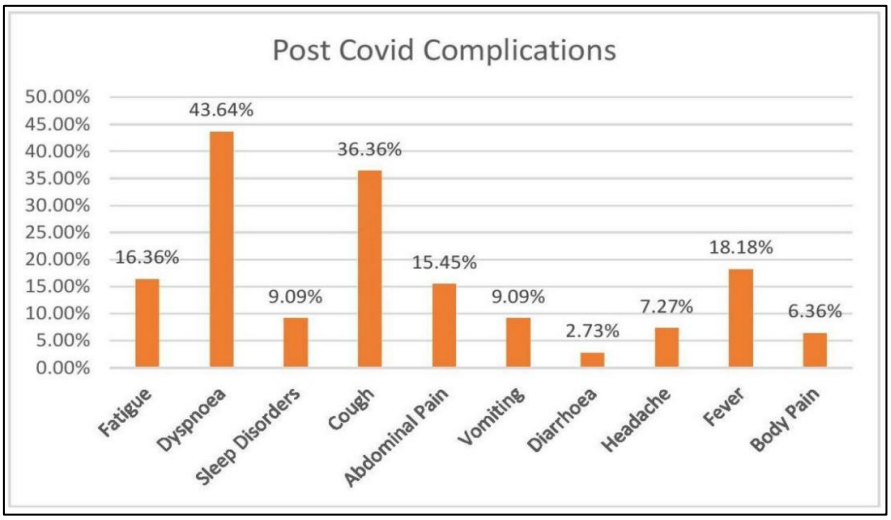

Fig. 2: Post Covid complications

The reported complications among the study subjects showed, most patients were presented with dyspnea (43.64%), and cough (36.36%), followed by fever (18.18%), fatigue (16.36%), abdominal pain (15.45%), vomiting and sleep disorders (9.09%), body pain (6.36%), diarrhoea (2.73%) which is shown in fig. 2.

Table 1: Post Covid complications v/s Gender

Post Covid Complications	SEX			
	Female		Male	
	f	%	F	%
Fatigue	11	21.6%	7	11.9%
Dyspnea	22	43.1%	26	44.1%
Sleep Disorder	5	9.8%	5	8.5%
Cough	15	29.4%	25	42.4%
Abdominal Pain	11	21.6%	6	10.2%
Vomiting	7	13.7%	3	5.1%
Diarrhoea	2	3.9%	1	1.7%
Headache	5	9.8%	3	5.1%
Fever	9	17.6%	11	18.6%
Body Pain	4	7.8%	3	5.1%

Due to biological and immunological differences in males and females, the ability to fight SARS COVID-19 infection may vary based on the gender which is shown in table 1. Among the 110 subjects included 46.4% were females and 53.6% were males. The study showed most of the respondents were males (53.6%) which was different from the study conducted by Cesar Fernandez-de-las-penas *et al.,* reported that the number of Post Covid symptoms was significantly higher in females than in males [5].

Out of 110 patients, 75 presented with multi-organ complications. In, some cases patients were presented with more than one complication which is shown in table 2. Most prevalent was infections (37.5%), followed by cardiovascular complications (29.17%), pulmonary complications (25%) and rare complications (8.33%).

Table 2: Categorization of Post Covid complications based on Organ-System

Complications	f	%
Pulmonary complications	24	25
Cardiovascular complications	28	29.17
Infections	36	37.5
Rare complications	8	8.33

Long covid syndrome includes hypercoagulable and hyperinflammatory states that affect multiple organ systems which is shown in fig. 3.

Lungs are the most affected organ during Covid-19 infection; as a result most of the persistent symptoms in Long Covid patients are mainly related to the pulmonary system. Most of the subjects were found to experience persistent respiratory symptoms months after their initial infection. Among the 110 patients twenty-seven had pulmonary complications.

Individuals are at high risk of cardiovascular complications after being infected with Covid-19. Symptoms like dyspnea, chest pain and shortness of breath may be due to cardiac complications persisting in these individuals. Myocardial and vascular inflammation, thrombotic events and direct cardiotoxicity may occur as a result of cytokine storm due to increased expression of ACE-2.

Pre-existing comorbidities like CAD, hypertension, dyslipidemia have increased risk of developing cardiac manifestations in Post Covid patients.

Patients recovered from Covid-19 were observed to acquire several infections like bacterial, fungal or others due to reduced response of immune system, re-infection of the virus, prolonged hospitalization etc. Thirty-six patients had infections on admission.

Among the 110 study subject's acute thyroiditis and pyelonephritis (1.8%) was reported followed by TB, dementia, fibrosis, and fungal infection (0.9%).

The table 3 shows the variations in lab parameters and was classified as escalated, normal and lower values depending on the changes from the date of admission to that of discharge. Despite significant

abnormalities at the time of admission, blood test results had returned to normal levels in majority of patients at the time of discharge.

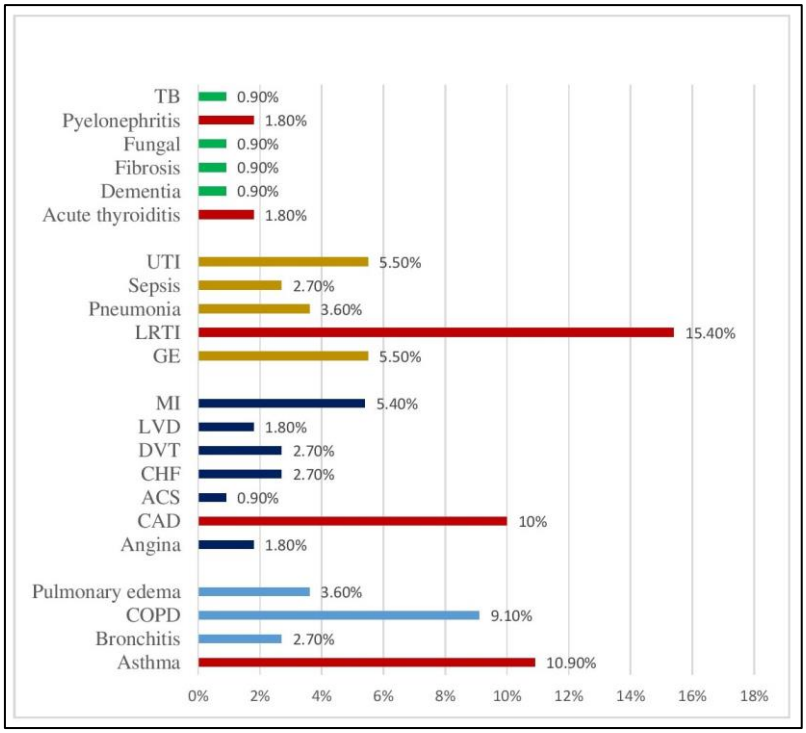

Fig. 3: Organ System-based complications

Table 3: Variations in Lab Parameters

Lab data	E-Elevated L-Lower N- Normal	%
Total count	E	32.70%
	L	0.90%
	N	57.30%
CRP	E	40.90%
	N	9.10%
Platelet count	E	2.70%
	L	0.90%
	N	71.80%
ESR	E	70.00%
	N	3.60%
D-dimer	E	10.00%
	N	16.40%
Troponin	E	17.30%
	N	16.40%
FBS	E	46.40%
	N	39.10%
Sodium	L	9.10%
	N	68.20%
Potassium	E	1.80%
	L	6.40%
	N	69.10%
Serum creatinine	E	20.90%
	N	60.90%
SGPT	E	12.70%
	N	66.40%
SGOT	E	11.80%
	N	67.30%
ALP	E	5.50%
	N	61.80%
Prothrombin time	E	8.20%
	L	3.60%
	N	11.80%

As there is multiple organ involvement in Post Covid syndrome, the management is symptomatic as shown in table 4. Depending on the organ system involved and the complications presented, the therapy was intiated in the subjects.

Table 4: Management of Complications

Drugs	f	%
Antibiotic	86	78.18%
Steroid	32	29.09%
Antiplatelets	33	30%
Anticoagulants	13	11.81%
Inhalers	49	44.54%
Bronchodilators	41	37.27%
Digoxin	7	6.36%
Antifibrotics	1	0.9%
Monoclonal antibodies	1	0.9%

Out of 110 subjects selected, 36 subjects had infections. Most commonly prescribed antibiotic was cefoperazone (49.5%), ceftriaxone (16.2%), meropenem (13.5%), clarithromycin (6.3%), faropenem and amoxicillin (1.8%), piperacillin, cefotaxime, cefpodoxime, amikacin, ciprofloxacin (0.9%). However, study conducted by Marie Chedid *et al.*, based on antibiotics in treatment of Covid-19 complications reported antibiotic usage was 74.0% out of it. Fluoroquinolones were the most used, with 56.8% of patients, followed by ceftriaxone in 39.5% of patients [6].

As Post Covid syndrome might cause hypercoagulable and hyperinflammatory states due to cytokine storm, usage of steroids was beneficial. The most prescribed was methylprednisolone (18.9%), betamethasone and hydrocortisone (4.5%), budesonide and dexamethasone (2.7%). The study conducted by Nitin Goel *et al.*, on Systemic corticosteroids for management of long Covid showed 49% of the patients were prescribed oral corticosteroids in tapering doses for 6 to 8 weeks [7]. Out of these, 75% of the patients did not have any pre-existing respiratory illness.

28 patients in 110 subjects had cardiovascular complications. Clinical evidences shows that Covid-19 infected patients may have high degree of thrombotic events in long run due to high level of sustained platelet activation. Therefore, the antiplatelets prescribed were aspirin (11.8%), aspirin-clopidogrel combination (10.9%) and clopidogrel (7.3%).

Long Covid syndrome may cause increased levels of pro inflammatory cytokines, which may lead to hypercoagulable state and related clinical events. Therefore, the anticoagulants prescribed were LMWH (4.5%), DOAC (3.6%), UFH (2.7%), warfarin (1.8%). Dimitrios Giannis *et al.*, [8], followed hospitalized patients with Covid-19 for mean 92 days and revealed that VTE, Arterial Thromboembolism, and Arrhythmogenic Cardiomyopathy occur with a higher frequency during the post-discharge period than previously reported and they found that the use of post discharge anticoagulants, mostly at prophylactic doses, was associated with a reduction of the risk of major thromboembolic events and death by 46%.

Among the rare complication, one patient reported with pulmonary fibrosis for which antifibrotic agents were prescribed. The agents prescribed were nintedanib (0.9%) and pirfenidone (0.9%).The study conducted by Saha A *et al.*, found that a combination of azithromycin, prednisolone and pirfenidone for up to 1 year showed improvement in oxygenation, six-minute walk test and HRCT changes [9].

Baricitinib (0.9%) has been used in a patient with ESRD, history of renal transplant with progressive dyspnea and pulmonary Mucormycosis. The study conducted by the hospitals in Prato and Alessandria reported Baricitinib treatment was well tolerated with no serious adverse events. This therapy significantly improved the clinical and laboratory parameters, none of the patients required ICU support, and the majority of the patients were discharged [10].

Digoxin (6.4%) was prescribed in the study subjects as the patients presented with increased risk of CHF.

The most affected system is pulmonary system. The symptoms may persist as lungs are one of the primary sites of viral infection. The most prescribed inhalers were budesonide (39.6%), formoterol (29.7%), salbutamol (11.7%), ipratropium (6.3%) and glycopyrrolate (11.7%). The study conducted by Mauro Maniscalco *et al.*, [11], reported that the treatment with bronchodialtor can induce functional improvement in post covid patients with COPD and asthma.

The bronchodilators prescribed are theophylline-etophylline (20.7%), montelukast (18.9%), acebrophylline (18%), formoterol and salbutamol (2.7%). The study conducted by Nitin Goel *et al.*, [12] showed the patients were treated with Inhaled corticosteroids and long-acting beta agonist (40.81%) followed by Oral and inhaled corticosteroids (14.28%),

short course (7 days) of oral corticosteroids (16.32%) and Oral acebrophylline (83.67%).

Table 5: Dose of Vaccine

Completed doses	f	Percent
0	23	20.0
1	15	13.0
2	70	60.9
3	2	1.7

In 110 study subjects, 79.1% were vaccinated whereas, 20.9% were not vaccinated. Among the vaccinated group, 64.5% received Covishield, followed by Covaxin (13.6%) and Comirnaty [Pfizer] (0.9%). Among the vaccinated 13% completed first dose and 60.9% completed their second dose while only 1.7% of subjects completed third dose of vaccination that is shown in table 5.

The association between Post Covid complications and vaccination was estimated using chi-square test which is shown in table 6. The relation between these variables were not statistically significant i.e.($p>0.05$).

Table 6: Post Covid complications v/s Vaccination

Post Covid complications		Vaccinated				$\chi 2$	df	*p-value*
		No		Yes				
		f	%	f	%			
Fatigue	Yes	4	17.4%	14	16.1%	0.022	1	*0.881*
	No	19	82.6%	73	83.9%			
Dyspnoea	Yes	12	52.2%	36	41.4%	0.862	1	*0.355*
	No	11	47.8%	51	58.6%			
Sleep Disorder	Yes	2	8.7%	8	9.2%	0.005	1	*0.941*
	No	21	91.3%	79	90.8%			
Cough	Yes	8	34.8%	32	36.8%	0.031	1	*0.859*
	No	15	65.2%	55	63.2%			
Abdominal Pain	Yes	4	17.4%	13	14.9%	0.83	1	*0.773*
	No	19	82.6%	74	85.1%			
Vomiting	Yes	1	4.3%	9	10.3%	0.792	1	*0.374*
	No	22	95.7%	78	89.7%			
Diarrhoea	Yes	1	4.3%	2	2.3%	0.288	1	*0.592*
	No	22	95.7%	85	97.7%			
Headache	Yes	1	4.3%	7	8.0%	0.369	1	*0.544*
	No	22	95.7%	80	92.0%			
Fever	Yes	4	17.4%	16	18.4%	0.12	1	*0.912*
	No	19	82.6%	71	81.6%			
Body Pain	Yes	1	4.3%	6	6.9%	0.198	1	*0.656*
	No	22	95.7%	81	93.1%			

At the time of the survey, 39.35% respondents were yet to complete their scheduled second vaccination while 60.25% had received both doses of the vaccine. The data showed that 58.94 % below 45 years received both doses of the vaccine, as did 64.53% above 45 years before the second wave hit India. Statistically, the difference between symptoms in vaccinated and non-vaccinated respondents was not significant [p=.511553]. 79.68% (n=102) of the respondents who had only one dose of vaccination showed mild symptoms compared to 83.64% who had both doses. Statistically, the difference between symptoms in those who received a single dose, or two doses was not significant [p=.35324].

The EuroQol Five Dimension (EQ-5D-5L) index score, EuroQol Visual Analog Scale (EQVAS) were used to assess the quality of life of patients with long Covid. EQ-5D-5L score and EQ VAS score was collected during the time of admission and 45 days after discharge to analyze the quality of life of the study subjects. The data collected during time of admission was considered as baseline and follow up data was taken to study the improvement in quality of life of the Post Covid subjects.

The first criteria analyzed were mobility, which ranges from a score between 0-5. The score was chosen based on patients clinical condition and its follow up was taken after 45 days and is shown in fig. 4.

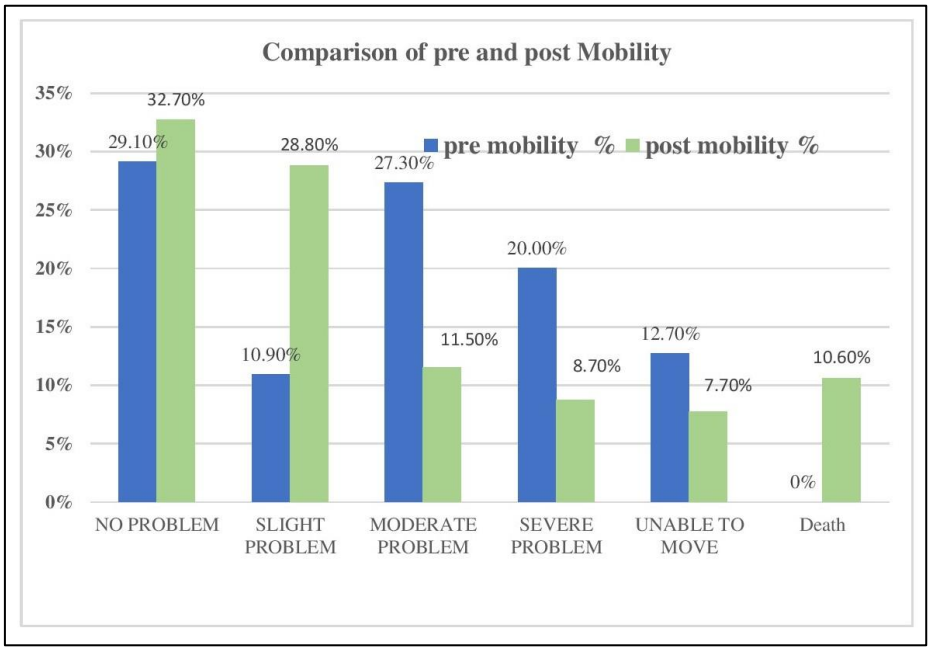

Fig. 4: Comparison of pre and post Mobility

Table 7: Paired t-test for Mobility

Mobility	Mean	SD	Mean change	n	t	df	*p-value*
Pre test	2.80	1.410	0.817	93	5.421	92	< 0.001
Post test	1.98	1.386					

The mean column displays the mean pre-test and post-test EQ-5D-5L mobility score among samples. SD is the standard deviations in pre & post EQ-5D-5L total score respectively. Mean change 0.817 is the difference between pre- test and post-test mean (2.80 and 1.98). Since the *t-value*, 5.421 shows $p < 0.001$, there is a significant difference existing between the pre-test and post-test EQ-5D-5L mobility score among the study subjects. This proves that there is a significant improvement in the mobility of the patients as shown in table 7.

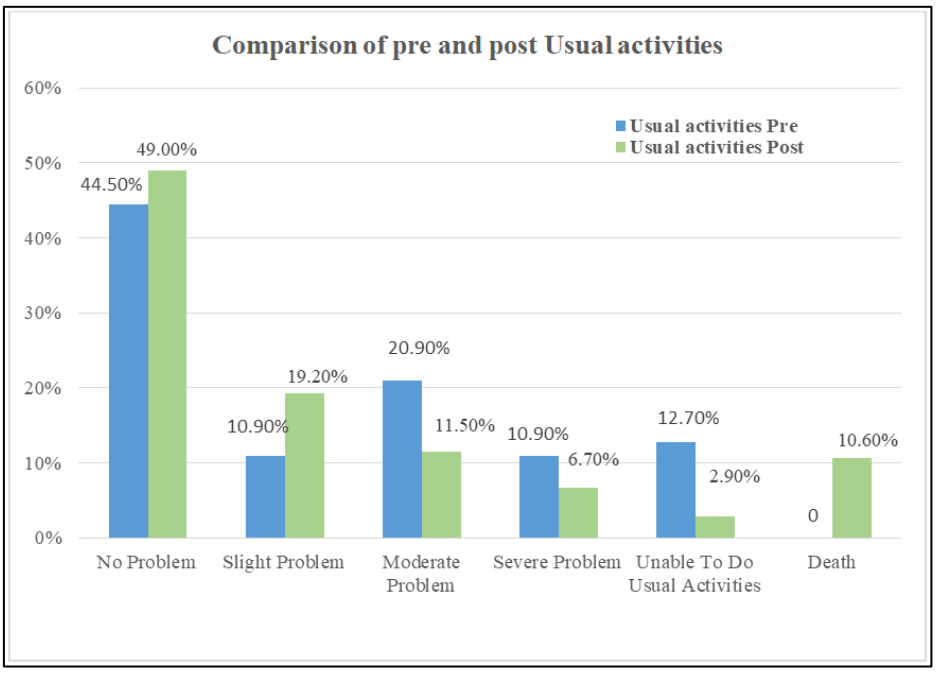

Fig. 5: Comparison of pre and post usual activities

The second criteria analyzed were usual activities, which ranges from a score between 0-5. The score was chosen based on patient's clinical condition and its follow up was taken after 45 days and is shown in fig. 5.

Table 8: Paired t-test for usual activities

Usual activities	Mean	SD	Mean change	n	t	df	*p-value*
Pre test	2.38	1.477	0.750	93	4.819	92	< 0.001
Post test	1.63	1.199					

The mean column displays the mean pre-test and post-test EQ-5D-5L usual activities score among samples. SD is the standard deviations in pre & post EQ-5D-5L total score respectively. Mean change 0.750 is the difference between pre-test and post-test mean (2.38 and 1.63). Since the *t-value*, 4.819 shows $p < 0.001$, there is a significant difference existing between the pre-test and post-test EQ-5D-5L usual activities score among the study subjects. This proves that there is a significant improvement in the usual activities of the patients as shown in table 8.

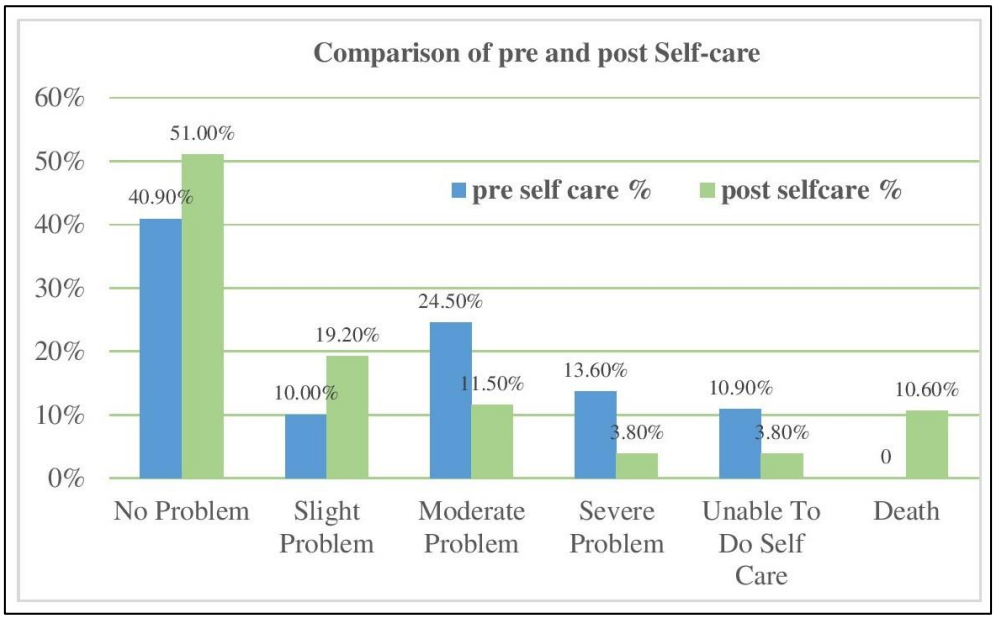

Fig. 6: Comparison of pre and post Self-care

The third criteria analyzed were self-care, which ranges from a score between 0-5. The score was chosen based on patient's clinical condition and its follow up was taken after 45 days and is shown in fig. 6.

Table 9: Paired t-test for Self-care

Self-care	Mean	SD	Mean change	n	t	df	*p-value*
Pre test	2.46	1.434					
Post test	1.59	1.179	0.875	93	5.712	92	< 0.001

The mean column displays the mean pre-test and post-test EQ-5D-5L self-care score among samples. SD is the standard deviations in pre & post EQ-5D-5L total score respectively. Mean change 0.875 is the difference between pre- test and post-test mean (2.46 and 1.59). Since the *t-value*, 5.712 shows $p < 0.001$, there is a significant difference existing between the pre-test and post-test EQ-5D-5L self-care score among the study subjects. This proves that there is a significant improvement in the self-care of the patients as shown in table 9.

The fourth criteria analyzed were pain or discomfort, which ranges from a score between 0-5. The score was chosen based on patient's clinical condition and its follow up was taken after 45 days and is shown in fig. 7.

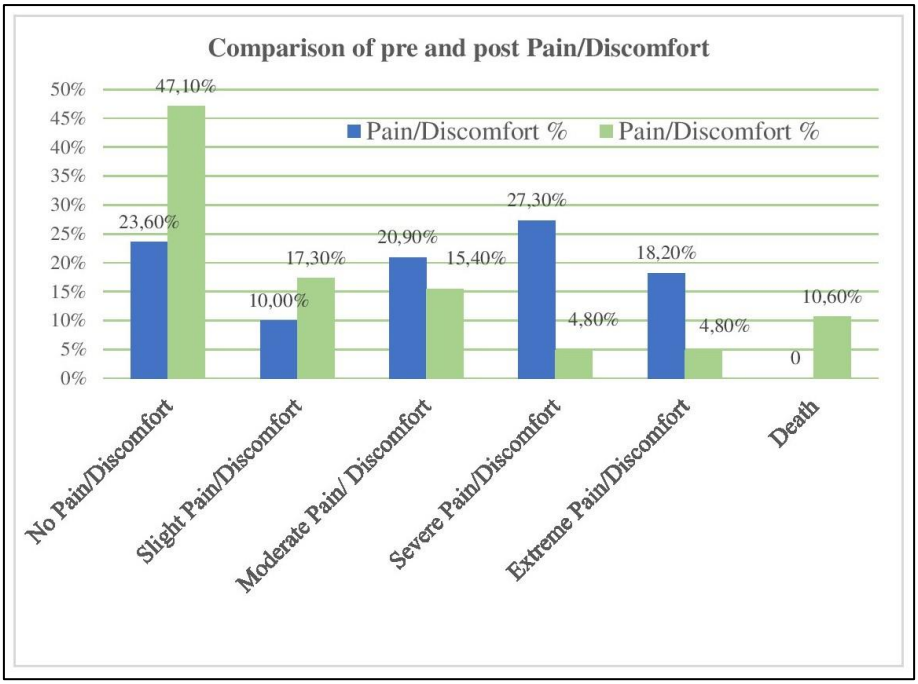

Fig. 7: Comparison of pre and post Pain/Discomfort

Table 10: Paired t-test for Pain/Discomfort

Pain/discomfort	Mean	SD	Mean change	n	t	df	*p-value*
Pre test	3.13	1.434	1.423	93	9.441	92	< 0.001
Post test	1.71	1.267					

The mean column displays the mean pre-test and post-test EQ-5D -5L pain/discomfort score among samples. SD is the standard deviations in pre & post EQ-5D-5L total score respectively. Mean change 1.423 is the difference between pre-test and post-test mean (3.13 and 1.71). Since the *t-value*, 9.441 shows $p <$ *0.001,* there is a significant difference existing between the pre-test and post-test EQ-5D-5L pain/discomfort score among the study subjects. This proves that there is a significant improvement in the pain/discomfort of the patients as shown in table 10.

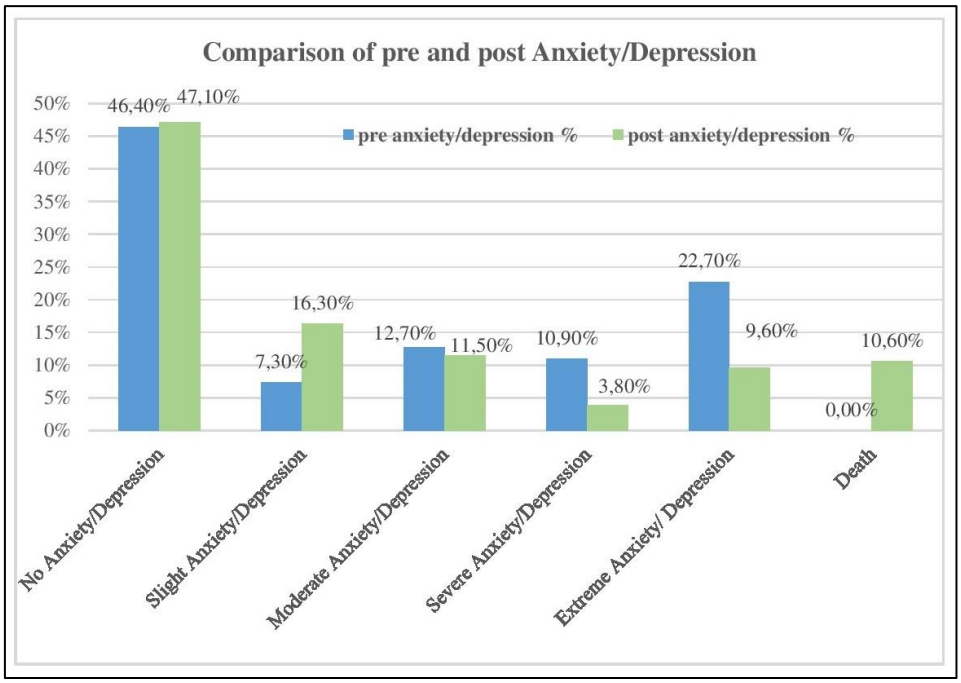

Fig. 8: Comparison of pre and post Anxiety/Depression

The final criteria analyzed were anxiety or depression, which ranges from a score between 0-5. The score was chosen based on patient's clinical condition and its follow up was taken after 45 days and is shown in fig. 8.

Table 11: Paired t-test for Anxiety/Depression

Anxiety/depression	Mean	SD	Mean change	n	t	df	*p-value*
Pre test	2.63	1.685	0.731	93	3.671	92	< 0.001
Post test	1.89	1.734					

The mean column displays the mean pre-test and post-test EQ-5D-5L anxiety/depression score among samples. Mean change 0.731 is the difference between pre-test and post-test mean (2.63 and 1.89). Since the *t-value*, 3.761 shows $p < 0.001$, there is a significant difference existing between the pre-test and post-test EQ-5D-5L anxiety/depression score among the study subjects. This proves that there is a significant improvement in the anxiety/depression of the patients as shown in table 11.

Table 12: Euro-Qol Total Score

EQ-5D- 5L total score	Mean	SD	Mean change	n	t	df	*p-value*
Pre-Test	12.59	5.671					
Post Test	9.57	4.849	3.011	93	6.655	92	<0.001

The mean column displays the mean pre-test and post-test EQ-5D-5L score among samples. SD is the standard deviations in pre & post EQ-5D-5L total score respectively. Mean change 3.011 is the difference between pre-test and post-test mean (12.59 and 9.57). Since the *t-value*, 6.655 shows $p < 0.001$, there is a significant difference existing between the pre-test and post-test EQ-5D-5L total score among the study subjects. This proves that there is a significant improvement in quality of life of the patients which is shown in table 12. The study conducted by Dominik Menges *et al*., [13], reported no mobility problems for 88.8% and mobility problems for 11.2%, Selfcare problems was reported by 0.5% and no problems by 99.5%, unable to do usual activities was shown by 10.5% and no problem by 89.5%, problems associated with pain was shown by 35.3% and no problems by 64.7%, anxiety/depression was shown by 30.9% and no problems by 69.1%.

Table 13: Euro-Qol VAS score

EQ-5D -5L VAS score	Mean	SD	Mean change	n	t	df	*p-value*
Pre test	61.80	21.052					
Post test	71.31	21.073	9.511	93	5.551	92	<0.001

The mean column displays the mean pre-test and post-test EQ-5D 5L VAS score among samples. SD is the standard deviations in pre & post EQ-5D 5L VAS score respectively. Mean change 9.511 is the difference between pre- test and post-test mean (61.80and 71.31). Since the *t-value*, 5.551 shows $p < 0.001$, there is a significant difference existing between the pre-test and post-test EQ-5D-5L VAS score among the study subjects. This proves that there is a significant improvement in quality of life of the patients which is shown in table 13.

Among 110 patients, 81 patient's blood type data were recorded. Among the blood groups, O+ had the most reported Post Covid complications while AB group had the least as shown in table 14. In the case group, 55 males and 50 females were noted and compared with that of the control group that consist of 56 males and 47 females. Results concluded that females with blood type A had much higher risk of acquiring infection [14].

Table 14: Blood Group Association

Blood group	f	Abdominal pain	Vomiting	Cough	Headache	DOE	Diarrhoea	Fatigue	Sleep disorder
A+	13	3	2	5	1	6	0	2	1
A-	2	1	1	0	1	1	0	0	1
AB+	1	0	0	0	0	1	0	0	0
AB-	1	0	0	1	0	1	0	0	0
B+	20	5	2	7	2	9	1	3	1
B-	3	0	0	1	1	0	0	2	0
O+	38	5	3	12	2	12	1	5	4
O-	3	0	0	2	0	1	0	0	0

CONCLUSION

Most of patients were men aged above 60 years. Dyspnea and cough were most reported complication. Therapy was initiated based on the presenting complaints and complications of the patients and there was a significant improvement in the quality of life of the patients during the follow up. The study concluded that there was no association between vaccination and Post Covid complications.

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