Prevalence and clinical presentation of Post-COVID syndrome in patients recovered from acute COVID infections in North Kerala

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ABSTRACT

Background: Post-acute COVID symptoms have become a major health concern and one of the most important causes of morbidity throughout the world. Hence, it is important to document the pattern of presentation in post-COVID syndrome patients in India, which has been one of the countries with the largest acute COVID-19 infections. **Aims and Objectives:** This study was done to estimate the prevalence of post-acute COVID syndrome in patients recovered from acute COVID infection and to determine the factors influencing with its incidence. **Materials and Methods:** Community-based observational study in which patients who have recovered from acute COVID infection 3–6 months before the study period were selected using multistage sampling. Data were collected through house visits using a pre-validated questionnaire containing details of acute COVID-19 infection, treatment taken, vaccination status before the infection, symptoms in the period between 4 and 12 weeks, and symptoms after 12 weeks of acute COVID infection. **Results:** Out of the 265 patients studied, 14.34% had ongoing symptomatic COVID-19 in the first 3 months of acute illness and 9.81% had post-COVID symptoms even after 3 months. 17.74% of the patients had a history of pre-existing comorbid illnesses and 31.32% had received two doses of vaccination before acquiring COVID-19 infection. 92.83% were treated in home quarantine, 4.91% needed hospitalization without oxygen supplementation, and 2.26% required oxygen or ventilatory support. The most common post-COVID symptoms reported were tiredness, easy fatiguability, breathlessness, and body ache. Female gender, presence of comorbidities, and mode of treatment had a significant role in predicting the incidence of post-COVID symptoms. **Conclusion:** The study clearly showed that the severity of acute COVID infection has a significant correlation with the incidence of both ongoing symptomatic COVID and post-COVID syndrome. Other factors that increased the incidence included female gender and pre-existing comorbidities.

Key words: Post-acute COVID-19 syndrome; Prevalence; COVID-19; Comorbidity

INTRODUCTION

COVID-19 pandemic has been one of the most important health concerns worldwide for the last 2 years. It was responsible for a sizable proportion of mortality and morbidity worldwide. Post acute COVID symptoms has become a major public health concern and is now one of the important cause of morbidity throughout the world.[1,2] It involves multiple organ systems and may be seen even in patients with mild acute COVID-19 illness.[2,3] Post-acute COVID symptoms may commonly include fatigue, shortness of breath, chest pain, mental disorders, and anosmia.[3] According to a collaborative consensus document by the National institute for health and care excellence UK post-acute COVID symptoms may be further divided into two categories:[1] Ongoing symptomatic COVID-19, which includes symptoms presenting between 4 and 12 weeks after acute COVID-19; and[2] Post-COVID-19 syndrome

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which includes symptoms presenting even after 12 weeks of the onset of acute COVID-19 and cannot be attributed to any alternative diagnoses.[2,4]

It is important that we document the pattern of presentation in post-COVID syndrome patients in India as it has been one of the countries with the largest acute COVID-19 infections.[5] Previous studies mainly documented post-COVID symptoms in moderate-to-severe COVID illness who needed admission. The majority of the acute COVID-19 patients were asymptomatic or mildly symptomatic, needing only treatment in home quarantine during the acute illness, and data regarding the prevalence of post-COVID symptoms in those patients are not adequately available.[6] The incidence of post-COVID symptoms in relation to pre-existing comorbidities, vaccination status, and severity of acute illness need to be understood to predict the level of morbidity that is to be expected in our society in the coming years due to this disease. Studies comparing the incidence of post-COVID symptoms in vaccinated individuals to unvaccinated individuals in Western countries show mixed results, with few studies showing the protective role of COVID vaccines in reducing the incidence of post-COVID symptoms.[7] There are only limited studies in India regarding this aspect.

Aims and objectives

Our aim in this study is to determine the prevalence of post-COVID symptoms among patients with previously documented acute COVID illness and to determine the factors which can influence in its incidence.

MATERIALS AND METHODS

It is a community-based observational study conducted in the Kannur district, Kerala, during the year 2022. Documented COVID-19 patients above the age group of 18 years who had developed the infection between 3 and 6 months before the study period residing in randomly selected wards in 10 g panchayaths of Kannur district were included in the study. A maximum of 30 patients each were randomly selected from the list of patients satisfying the inclusion criteria from each of the 10 previously selected wards. Those patients who did not give consent and those who were expired before the study period with unrelated causes were excluded from the study. Data collection was done by trained volunteers by house visits using pre-validated questionnaire. The questionnaire included data regarding the details of COVID-19 infection, treatment taken, vaccination status before the infection, symptoms between 4 and 12 weeks and symptoms after 12 weeks of acute COVID infection.

Institutional ethical committee approval was obtained before pursuing the study. Informed written consent was obtained from all the study participants before data collection, and the confidentiality of the study participants were strictly ensured. Data collected were entered in Microsoft Excel and were analyzed through R software (R studio version 2021.09.1+372). Descriptive statistics are presented through frequencies, percentages, mean, and standard deviation. Inferential statistical methods such as Fisher's exact test and logistic regression analysis were used appropriately in the data analysis.

RESULTS

A total of 265 patients satisfying inclusion criteria were enrolled in the study, of which 51.7% were female and 48.3% were males. The mean age of the study population was 45.64±16.00. 47 (17.74%) had some pre-existing comorbid illness, of which type 2 diabetes, hypertension, coronary artery disease, and lung diseases were more prevalent before acquiring COVID infection.

83 (31.32%) of them received both doses of COVID vaccination and 77 (29.06%) received a single dose of vaccination. Rest were not vaccinated against COVID-19 when they acquired the infection. During the illness majority of them only suffered from mild infection. 246 (92.83%) were treated in-home quarantine, whereas 13 (4.91%) where hospitalized without any oxygen requirement. Only 6 (2.26%) patients developed severe disease requiring oxygen or ventilator support (Table 1).

Inquiry about the current health status revealed that 197 patients (74.34%) had reached pre-COVID health status during the study period which was 3 months after the acute COVID infection, whereas 68 (25.66%) patients reported that their health had not returned to pre-COVID level. Of the 265 patients, 14.34% had various symptoms in the first 3 months after acute COVID infection (Ongoing symptomatic COVID-19) and 9.81% had symptoms even after 3 months of acute COVID-19 infection (Post-COVID-19 period). The most common symptoms reported in both periods were tiredness, easy fatiguability, breathlessness, and body ache (Table 2).

Comparing the incidence of symptoms in post-COVID period based on the severity of acute COVID-19 infection evidenced by the required mode of treatment using Fisher's exact test showed a statistically significant difference between the three treatment groups ($P<0.001$) (Figure 1).

Similarly, when the incidence of symptoms presenting during the initial 3 months period after acute COVID infection (ongoing symptomatic COVID) where compared
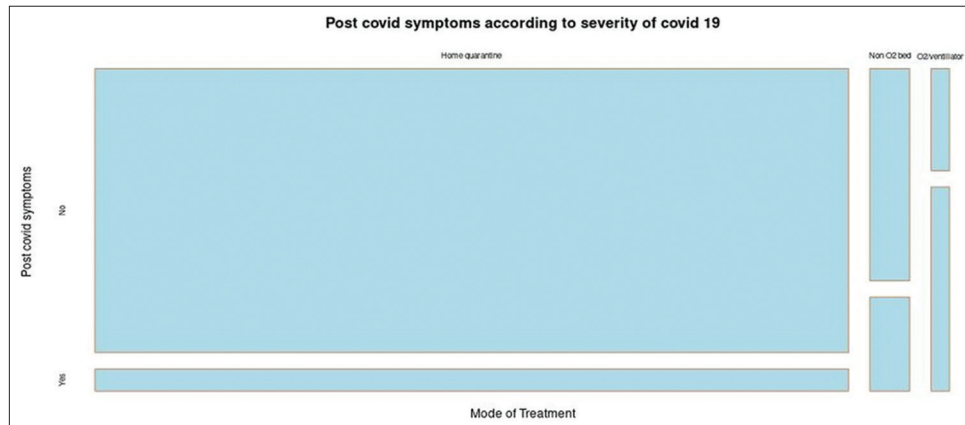
Figure 1: Mosaic plot of post COVID symptoms against different modes of treatment during acute infection
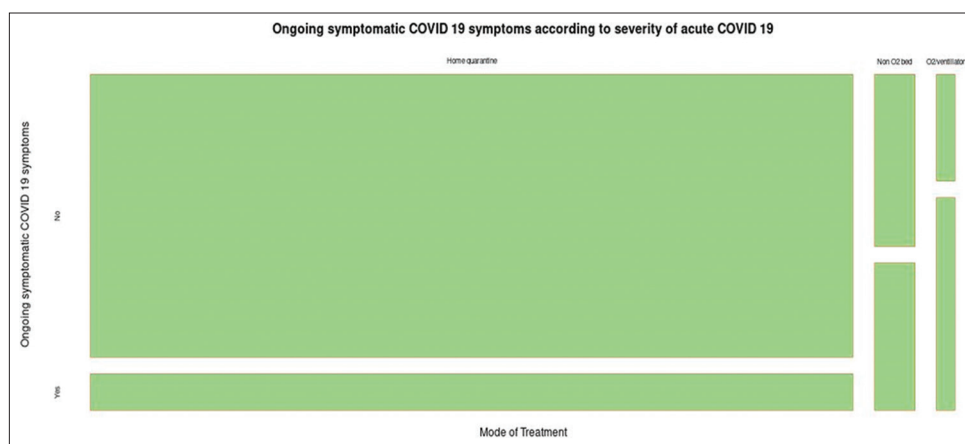

Figure 2: Mosaic plot of ongoing symptomatic COVID symptoms against different modes of treatment during acute infection

Table 1: Baseline characteristics of the study population	
Baseline characteristic	**Frequency (%)**
Gender	
Male	128 (48.3)
Female	137 (51.7)
Pre-existing comorbidities	
Diabetes mellitus	19 (7.17)
Hypertension	20 (7.55)
Lung diseases	8 (3.02)
Coronary artery disease	4 (1.51)
Chronic kidney disease	1 (0.38)
Malignancy	1 (0.38)
Others	5 (1.89)
Vaccination status	
Not vaccinated	105 (39.62)
Single dose vaccination	77 (29.06)
Double dose vaccination	83 (31.32)
Mode of treatment	
Home quarantine	246 (92.83)
Non oxgen bed hospitalisation	13 (4.91)
Oxygen/Ventillatory support	6 (2.26)

Table 2: Frequency of post acute COVID-19 symptoms among study population		
Symptoms	**Ongoing symptomatic COVID (4 weeks to 3 months) (%)**	**Post COVID period >3 months) (%)**
Tiredness	13 (4.91)	12 (4.53)
Easy fatiguability	10 (3.77)	8 (3.02)
Breathlessness	10 (3.77)	5 (1.89)
Bodyache	9 (3.39)	7 (2.64)
Cough	6 (2.26)	3 (1.13)
Insomnia	2 (0.75)	4 (1.51)
Palpitation	1 (0.38)	1 (0.38)
Chest Pain	0 (0)	2 (0.75)
Others	5 (1.89)	3 (1.13)

between different treatment groups using Fisher's exact test also showed a statistically significant difference between them (P<0.001) (Figure 2).

Comparing the presence of post-COVID symptoms between patients having pre-existing comorbidities and those who do not have them, using Fisher's exact test revealed that those with comorbidities have 4.104 (CI: 1.57, 10.47) times the odds of developing symptoms over those who do not have them (P=0.0017). Comparing the presence of post-COVID symptoms between patients with various vaccination status using Fisher's exact test showed that there is no statistically significant difference

between the incidence of symptoms among the various groups (P=0.704).

Logistical regression analysis was also performed to assess the ability of various clinical parameters, namely age, gender, presence of comorbidities, vaccination status, and mode of treatment, to predict the incidence of post-COVID symptoms in patients. It showed that only gender, presence of comorbidities, and mode of treatment had a statistically significant role in predicting the incidence of post-COVID symptoms. Female patients had 2.78 times higher odds of having post-COVID symptoms than male patients (P=0.026). The patient who had hospitalized treatment without oxygen support had 5.62 times higher odds (P=0.007) of having post-COVID symptoms over those who received treatment under home quarantine, whereas those who needed oxygen/ventilatory support had 25.33 times higher odds (P<0.001) of having post COVID symptoms over the home quarantined group.

DISCUSSION

In this study, even though majority of patients (92.83%) had only mild symptomatic acute COVID-19 infection, 25.66% of them had reported that they have not achieved pre-COVID health status even after 3 months. Of the patients studied, 14.34% had ongoing symptomatic COVID after 4 weeks and 9.81% had post-COVID symptoms after 3 months of acute COVID-19 infections. Various studies conducted the world over showed that the presence of post-COVID symptoms in cases of previous COVID infection ranged from around 26% to 47%.[8-11] A similar study by Naik et al., from North India reported that 12.1% of patients had ongoing symptomatic COVID after 4 weeks of infection and 9.9% had post-COVID symptoms after 3 months of acute COVID-19 infection.[12] All these reports are well in agreement with our findings in the South Indian population and shows that a rather uniform proportion of individuals are developing post-COVID symptoms globally. In our study population, the most common post-COVID symptoms included tiredness, easy fatiguability, and body ache, followed by respiratory symptoms such as breathlessness and cough. Most of the previous studies also reported fatigue as the most common symptom in post COVID period, which was followed by other symptoms such as myalgia, cough, breathlessness, and insomnia.[1,3,6,10-12] This was in accordance with the findings of our study.

Our study noted that the incidence of symptoms during both the ongoing symptomatic COVID period and post-COVID period were significantly related to the severity of acute COVID-19 infection, which in turn

was indicated by the mode of treatment required. Those who required oxygen or ventilatory support were having a significant increase in the incidence of post-COVID symptoms than those who had mild COVID infection requiring treatment under home isolation. Other factors that seem to determine the probability of post-COVID symptoms were the pre-existence of comorbidities and gender. Female gender and the presence of comorbidities significantly increased the chance of patients developing post-COVID symptoms. Factors such as age and vaccination status preceding the acute infection bore no significant influence on the incidence of post-COVID symptoms. Previous studies have also reported that the severity of acute infection, need for hospitalization, hypoxia during acute illness, and presence of comorbidities were independent factors determining the development of persistent symptoms in post-COVID period.[11,12] Some of the other studies have reported various factors, including lower age, lower baseline SARS-COV2 IgG levels, etc., may also influence the incidence of post-COVID symptoms.[1,10] The evidence regarding the impact of COVID vaccination prior to acute infection on the incidence of post-COVID symptoms were mixed with some studies showing evidence for the benefit of prior vaccination in preventing post-COVID symptoms and some studies showing nil benefit.[7] An interesting finding was reported by Ayoubkhani et al., which shows that vaccination after the acute COVID illness may reduce the incidence of post-COVID symptoms consistently.[13] Our study showed that prior vaccination had no bearing on the incidence of post-COVID symptoms. These mixed reports indicate that a long-term follow-up study is required to collect more evidence in this regard.

Limitations of the study

Our study used community-based data collection by house visits of the patients who were in the post-COVID period and majority of the study population were those who had the mild acute infection. It may have limited the number of patients with severe illness requiring oxygen and ventilatory support. Even then, it had succeeded in giving statistically significant evidence that patients with severe acute illness has a higher incidence of post-COVID symptoms. Long-term follow-up studies are essential to gather more robust evidence regarding other factors that may influence post-COVID syndrome.

CONCLUSION

The incidence of persistent post-acute COVID symptoms greatly depends on the gender of the patient, the pre-existence of comorbidities, and the severity of acute

COVID illness. The most common symptoms in such patients include fatigue, tiredness, and body ache, followed by respiratory symptoms. Patients with post COVID symptoms pose a major challenge to our health care system in the near future and management of this needs a multidisciplinary approach. Good understanding of the disease process and data regarding its prevalence is absolutely necessary to effectively plan the public health policy in this regard.

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