The application of six-minute walk test to identify ‘pre-hypoxemia’ phase in asymptomatic/mild disease COVID-19 patients managed in home isolation or primary health care setting

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Abstract

The clinical spectrum of COVID-19 infection patients extends from being asymptomatic to mild, moderate and severe disease. This classification is largely based on oxygen saturation and respiratory rate. Asymptomatic/mild disease patients are managed in home isolation or COVID care centers. A subgroup of these patients will deteriorate and develop moderate to severe disease. Six-minute walk test is useful in identifying this group of patients by inducing hypoxia in normoxemia patients. This stage of the disease is labelled as ‘pre-hypoxemia’ phase in asymptomatic/mild disease. Identifying this stage in the course of illness of patients will help in intercepting further deterioration at the earliest by timely intervention.

Keywords: COVID-19, pre-hypoxemia, SARS-COV-2, six-minute walk test

Introduction

COVID 19 pandemic, caused by coronavirus SARS-CoV-2 is unfolding its character. Unlike, influenza pandemics, scientists have very limited experience and poor understanding about the behavior of COVID pandemic. Mathematical models have been developed to predict the dynamics of this COVID pandemic. The multiple waves, shift in the virus genome, higher transmissibility, more younger patients, difference in impact in different geographic regions are characteristics observed of the COVID pandemic so far. In India, we are in the midst of the phase of widespread human infection labelled as second wave. The impact of the disease activity in the community has increased by many folds overwhelming the health infrastructure and capacity.

“Pre-hypoxemia’ phase of mild disease

The clinical spectrum of the SARS-CoV-2 infection varies from asymptomatic infection to mild, moderate and severe disease.[1] This division is largely based on oxygen saturation and respiratory rate. Majority of the patients don’t need hospitalization and are either asymptomatic or have a mild disease. The level of care required to manage such patients is very basic and are easily manageable under home isolation or at COVID care isolation facilities. In addition to symptomatic treatment, monitoring oxygen saturation with pulse oximeter is vital in such patients. Patients with risk factors for developing severe disease will require close monitoring for disease progression during home isolation. Unprecedented weekly growth in new cases added up
to the number of active cases in home isolation. A subset of patients under home isolation will desaturate and may have a progressive disease. Question is, can we recognize these patients as early as possible by simple clinical and investigational tools and plan a proper and early treatment plan. Monitoring oxygen saturation regularly by pulse oximetry plays an increasing role in managing pulmonary diseases, especially during influenza and COVID epidemics or pandemics. Surveillance for early detection of hypoxemia is essential. But, recognizing a connecting ‘pre-hypoxemia’ phase between the normoxemia and hypoxemia is crucial. A subgroup of ‘mild disease patient with pre-hypoxemia’ can be identified in the clinical spectrum of the COVID illness.

‘Pre-hypoxemia’ phase of mild disease versus happy hypoxia
In ‘happy hypoxia’ or silent hypoxia there is pronounced arterial hypoxemia without proportional signs of respiratory distress like tachypnea, dyspnea or active accessory respiratory muscles. These patients are already desaturated and fall in the stage of moderate to severe disease depending on the arterial saturation. Comparison, we induce hypoxia in patients with mild disease by a simple 6-minute walk test which helps in unmasking ‘pre-hypoxemia’ phase of mild disease. A proportion of patients with mild disease (SpO2 >94%) may desaturate during or after taking the walk test thus identify ‘pre-hypoxemia’ phase of mild disease.

6-minute walk test (6MWT)
The 6MWT has been employed to evaluate exercise capacity, assess prognosis and evaluate treatment response in chronic respiratory diseases. The 6MWT is one of the simplest home based tools. The test involves very low technology, is simple to perform and objectively evaluates latent hypoxia. The test involves assessment of arterial oxygen saturation measurement by pulse oximetry before starting the walk, during the walk and immediately at the end of six-minute walk. The test is self-paced and the patient has to walk for six minutes without a pause at a comfortable pace within his room/home with the pulse oximeter on the finger. The test can be self-monitored or by a family member and does not need the support of any paramedical personnel. The test is to be performed from the day of onset of symptoms to at least day 12 of the symptoms. Use the middle finger or index finger for taking the reading and avoid toes and earlobes. Only accept values accompanied with a strong pulse signal. Observe the pulse oximeter for 30 to 60 seconds and identify the most commonly measured value. Remove nail polish before taking the reading. Don’t take the reading on a wet finger or cold extremities. The concept of the test is to induce hypoxia thus helping in unmasking ‘pre-hypoxemia’ phase. The test is based on the principle to identify patients who are not hypoxic at rest, but become hypoxic on 6-minute walk. If the oxygen saturation drops by ≥3% from the baseline or to 93% or below during or after walk then the patient is advised to be shifted to a health center with oxygen facility.

Safety of 6-minute walk test
Scanty literature is available to address the safety of performing 6MWT in chronic respiratory diseases. Desaturation, chest pain and tachycardia are the common complications. Significant adverse events are rare. Safety of the test has to be maintained and the test should be terminated if patient develops significant desaturation, chest pain, intolerable dyspnea, leg cramps, staggering, diaphoresis, and pale or ashen appearance. The test should be performed with an access to a health care worker at least through teleconsultation for proper triage as well as to handle an adverse event.

Clinical implication of ‘pre-hypoxemia’ phase of mild disease
The clinical implications of identifying this ‘pre-hypoxemia’ stage of mild disease of the COVID infection are conjectural due to lack of documentary evidence till date. It is suggested that the health care provider or family member must keep a low threshold for early shifting of these patients to a COVID center which has an oxygen facility. These patients should be managed at least at a dedicated COVID care center under the supervision of a medical officer. Further, it is suggested that such patients may benefit with the initiation of treatment in the form of low dose oral steroids and anticoagulation. This strategy will improve monitoring and may prevent further deterioration of the patients. In the resource limited setting identifying patient with ‘pre-hypoxemic stage of mild disease’ will help in better triage and avoid unnecessary investigations.

Application of 6-minute walk test and identifying ‘pre-hypoxemia’ phase of mild disease in home isolation and primary care setting
On 16th of May 2021, Ministry of Health & Family welfare, Govt of India rolled out the SOP on COVID-19 containment and management in peri-urban, rural and tribal areas. The emphasis is on intensifying COVID-19 response through community-based services and primary level health infrastructure in these areas. The salient features of these guidelines involve monitoring of asymptomatic or mild diseases active cases in either home isolation or a COVID care center.

The community health officer, auxiliary nurse midwife and multipurpose health worker have been given the responsibility of nodal officer of COVID care centers. Pulse oximeter is included in the list of equipment to be made available at these centers. It is suggested that this human resource should be trained in conducting the 6 MWT and further triage the patient accordingly. The 6 MWT should be performed on daily basis at least once a day for optimum results. Further, resources have to be generated to make pulse oximeter available in every home isolation tool kit. Patients in home isolation are to be connected to the COVID care centers/dedicated COVID health center for remote monitoring and early intervention. The 6 MWT should be performed on daily basis by the patients in home isolation and convey the information accordingly.
6-minute walk test in children

In the management guidelines of COVID-19 in children issued by Director general health services (DGHS), India recommended the use of 6MWT in children above the age of 12 years with asymptomatic or mild disease under the supervision of parents/guardians.\[9\]

Conclusion

Early identification of ‘pre hypoxemic’ phase in the asymptomatic to mild patient category in COVID 19 can be a very important step in preventing the excess morbidity and mortality. The 6MWT being a simple and home based test can be of great help in identifying this subset of patients who have a potential to deteriorate. This simple intervention can help in initiating timely escalation of level of care and treatment in pre-hypoxemic COVID 19 patient management.

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Conflicts of interest

There are no conflicts of interest.

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