

# Sputum Testing as the New Mass Screening Method for COVID-19 Patients in India - A Public Health Perspective

## Abstract

In December 2019, an unusual form of pneumonia of unknown origin was identified in Wuhan and soon expanded into an intercontinental pandemic that affected nations all over the world. The unusual pneumonia was subsequently named COVID-19. The management of COVID-19 disease has been highly dependent on the early identification of patients who are positive for SARS-CoV-2 infection. For detecting the SARS-CoV-2 virus in upper or lower respiratory tracts, the Centers for Disease Control and Prevention (CDC) recommend strategic sampling approaches. Most countries collect nasopharyngeal swabs and oropharyngeal swabs for rapid viral testing by experienced healthcare workers. Due to the increase in single-day cases, the high cost of RT-PCR, and the requirement for greater coverage in order to detect COVID-19 infections, the screening method has been changed to the Rapid Antigen Test during this phase of the pandemic in India. Considering the limited sensitivity of the fast antigen test compared to the sputum test, and the benefit of having additional resources available from an already established TB network, policymakers should consider implementing COVID-19 with sputum testing. For India, which has 1.3 billion people and limited resources, contemplating a community level sample collection of COVID-19 samples will be an effective decision if scientific data is used for this purpose will be an effective choice for the country with more than 1.3 billion population and limited resources.

**Keywords:** COVID-19, mass screening, procedures, sputum,

A local pandemic involving multiple countries all over the world started in December 2019 when a rare form of pneumonia of unknown cause was identified in Wuhan, China.<sup>[1]</sup> The World Health Organization declared this epidemic a public health emergency on 30<sup>th</sup> January 2020. The WHO named this as COVID-19 on 11<sup>th</sup> February 2020.<sup>[2]</sup> COVID-19 was diagnosed as a global pandemic on 11<sup>th</sup> March 2020, due to the increasing viral spread in the days ahead and at such an alarming rate.<sup>[2]</sup> As of (01/05/2020), 3221029 cases have been affected by COVID-19 all over the world and 228252 people have died.<sup>[3]</sup> The greatest number of single day deaths was reported on 27<sup>th</sup> April 2020.<sup>[1]</sup> The toll was an astonishing 4982 death reported from all over the world. Due to the increase in population in urban areas, the disease was originally more prevalent, however, now it is widely prevalent in rural areas as well, since the workers in urban areas are returning to their rural homes, where they have spread the disease.<sup>[4]</sup>

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COVID-19 has focused on the detection of patients with SARS-Cov-2 infection early on. This is what has proven to be the most successful disease control method. Centre for Disease Control, US (CDC) recommends that lower respiratory and upper respiratory sampling be used for the detection of SARS-CoV-2.<sup>[5]</sup> In the upper respiratory tract, nasal swabs, nasal wash/aspirates, oral aspirates, nasal mid turbinates' (NMT), pleural fluid, lung biopsies, and transbronchial tube placement are the most commonly used collections, while broncho alveolar lavage, Tracheal aspirate, Pleural fluid, Lung biopsy, and Sputum sample can be collected from the lower respiratory tract. Nasopharyngeal/Oropharyngeal swabs are the most common method for viral detection due to their simplicity and less invasive nature. The only drawback is the high level of knowledge and expertise that is required to collect the sample. A false-negative result could result if the correct technique isn't followed during sample collection and might undermine the management of COVID-19.<sup>[6]</sup> A patient's sneeze or vomiting between procedures will

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**DOI:**  
10.4103/ijpvm.IJPVM\_323\_20

## Quick Response Code:



**How to cite this article:** Saleem SM, Bhattacharya S. Sputum testing as the new mass screening method for COVID-19 patients in India - A public health perspective. *Int J Prev Med* 2022;13:86.

cause an aerosol to form when using the adverse technique. This brings us to the question: Is there any other method available? An efficient way to collect and analyze samples? A method that requires less expertise, has increased sensitivity, and is equally as safe for the handlers?.

In a study conducted in China by "Chen *et al.*" demonstrating a positive result for COVID-19 in 22 cases collected over time, 545 samples were collected. Among the samples included were 209 pharyngeal swabs, 262 sputum samples, and 74 faeces samples. On days 13 and 39, RT-PCR testing found SARS-CoV-2 in the sputum and faeces of the cases, but not the pharyngeal samples.<sup>[7]</sup>

Another study by Anne L. Wyllie *et al.*<sup>[6]</sup> compared salivary sampling and nasopharyngeal swab sampling and concluded salivary sampling offers advantages over nasopharyngeal sampling. This method uses a non-invasive technique that can be self-administered. As a result of RT-PCR detection of respiratory pathogens, the two-sample types demonstrated comparable diagnostic sensitivity.

Results showed that saliva and self-collected saliva samples had comparable SARS-CoV-2 detection sensitivity compared to nasopharyngeal swabs collected by health care providers from COVID-19 patients.<sup>[6]</sup> Wenling Wang *et al.* used 1070 specimens collected from 205 COVID-19 patients and reported a sensitivity of 93% for Bronchoalveolar Lavage Fluid, followed by sputum (72%), nasal swabs (63%), fibro bronchoscope brush biopsy (46%), pharyngeal swabs (32%), faeces (29%), and blood (1%) respectively.<sup>[7]</sup>

Study results indicate that a comprehensive sample collection process and the selection of appropriate specimens for testing are crucial to the diagnosis of COVID-19. The Indian healthcare system is one of the largest and most robust healthcare networks in the world, supporting over 700 districts all over the country. When it comes to diagnosing COVID-19 cases, another aspect is the readiness of the healthcare system to make changes in order to test and detect more cases. Primary care is provided by sub-centres and primary health centres. Secondary care is provided by community health centres, sub-district hospitals, and district hospitals. Tertiary care is provided by the local medical college.<sup>[8]</sup> India's health system is unique in that for each endemic disease there is a specific national-level program. One such program is the National Tuberculosis Elimination Programme (NTEP), which was previously known as the Revised National Tuberculosis Elimination Programme (RNTCP). NTEP has the unique feature of having area-level supervisory staff and a sub-district unit for every 5 lacs of population. The program is decentralized with community participation. Screening of cases of tuberculosis takes place almost at the doorstep. Monitoring of patients on medication is done periodically with sputum microscopy and CBNAAT (cartridge-based nucleic acid amplification test). The network of machines in

India has over 2000 CBNAAT machines.<sup>[9]</sup> An expert team from India suggested that these CBNAAT machines be modified to examine COVID-19 using a different cartridge since India's testing facilities are limited for COVID-19.<sup>[10]</sup> For such a phase of the pandemic, Phase III, mass screening of the community is necessary. COVID-19 is on the rise in India, which suggests a possible cause is community transmission. It is the fear and stigma associated with the COVID-19 itself that raises the most concerns. In addition to the scarcity of personal protective equipment (PPE), logistics and infrastructure make it difficult for health care providers to handle such an outbreak.<sup>[11]</sup> This technique and specimen, along with the risks involved, make the process more complicated for healthcare workers. Our hypothesis is that NTEP's current infrastructure, personnel, and logistics will allow maximum effectiveness in the early detection of COVID-19 cases and overall disease containment. Instead of the expert technique of collecting nasopharyngeal swabs and transporting them in Viral Transport Media (VTM), a simple sputum sample can be self-collected by those with symptoms of influenza-like illness (ILI) in small plastic containers and get that delivered to the nearest tuberculosis unit for CBNAAT analysis. While we compare the nasopharyngeal sample with the sputum sample, the following can be observed:

Collecting sputum samples can be done by healthcare workers with little or no assistance. This is the case in hospitals, tertiary care centres, and sub-centres alike.

Sputum collection does not require too much expertise or generate large amounts of aerosol or droplets, which reduces the risk of health care workers getting infected. The procedure can either be performed at home or in an open area of the hospital.

The collection of sputum requires only sterile containers. Nasopharyngeal and Oropharyngeal swabs require sterile swabs along with sterile containers, as well as the wearing of personal protective equipment. The cumulative cost is much higher than the cost of a sputum collection.

The general public as well as health care workers are already familiar with the process of sputum collection. Under the NTEP, all periphery health workers are already sensitized to the process of sample collection and have already been trained to do so. In this respect, adopting an established older system is preferable to switching to an entirely new one.

During the home quarantine for SARS-CoV-2 positives, milder symptoms must be observed to prevent the spread of infection. RT-PCR should also be performed to determine the duration of home quarantine and the spread of the virus. The spreading of infection in the community can be stopped if we confine the person to their home for that period of time and collect the sample from their home.

## Conclusion

Presently, we are in that phase of the pandemic in India, where screening has been shifted to Rapid Antigen Test due mainly to a surge in single day cases, the cost of RT-PCR, and the need for higher coverage for detection of COVID-19 cases. Policymakers should consider sputum testing rather than rapid antigen testing as an alternative due to the low sensitivity of the rapid antigen test compared to sputum. They should also consider the benefit of using an already existing testing method with an already established tuberculosis network. In such a case, the collection of sputum samples may be recommended for the investigation of COVID-19 based on the above-mentioned scientific data which will be an effective option for India with more than 1.3 billion people and limited resources.

## Financial support and sponsorship

Nil.

## Conflicts of interest

There are no conflicts of interest.

**Received:** 07 Jun 20 **Accepted:** 29 Dec 21

**Published:** 24 Jun 22

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