

## HOW TO...

THERAPY AREA: OTHER

# How to spot COVID-19 patients: Speech & sound audio analysis for preliminary diagnosis of SARS-COV-2 corona patients

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**Abstract**

**Background:** The global cases of COVID-19 increasing day by day. On 25 November 2020, a total of 59 850 910 cases reported globally with a 1 411 216 global death. In India, total cases in the country now stand at 91 77 841 including 86 04 955 recoveries and 4 38 667 active cases as on 24 November 2020, as per the data issued by ICMR. A new generation of voice/audio analysis application can tell whether the person is suffering from COVID-19 or not.

**Aims:** To describe how to established a new generation of voice/audio analysis application to identify the suspected COVID-19 hidden cases in hotspot areas with the help of an audio sample of the general public.

**Materials & Methods:** The different patents and data available as literature on the internet are evaluated to make a new generation of voice/audio analysis application with the help of an audio sample of the general public.

**Results:** The collection of the audio sample will be done from the already suffered COVID-19 patients in (.Wave files) personally or through phone calls. The audio samples such as the sound of the cough, the pattern of breathing, respiration rate and way of speech will be recorded. The parameters will be evaluated for loudness, articulation, tempo, rhythm, melody and timbre. The analysis and interpretation of the parameters can be made through machine learning and artificial intelligence to detect corona cases with an audio sample.

**Discussion:** The voice/audio application current project can be merged with a mobile App called 'AarogyaSetu' by the Government of India. The project can be implemented in the high-risk area of COVID-19 in the country.

**Conclusion:** This new method of detecting cases will decrease the workload in the COVID-19 laboratory.

## 1 | BACKGROUND

The global cases of COVID-19 increasing day by day. On 25 November 2020, a total of 59 850 910 cases reported globally with a 1 411 216 global death.<sup>1</sup> In India, total cases in the country now stand at 91 77 841 including 86 04 955 recoveries and 4 38 667

active cases as on 24 November 2020, as per the data issued by ICMR.<sup>2</sup> Around 30 000 to 47 000 daily new cases were reported for the past some days in India.<sup>3</sup> The Indian Council of Medical Research (ICMR) reported three cases of COVID-19 re-infection in India from across the country so far, whereas 24 such cases have been found globally. Around 80% of COVID-19 patients present with mild or no

symptoms.<sup>4</sup> Symptoms may include fever, cough, aches, pains, and weakness, all common to cold and flu.<sup>4</sup> It is important to note that the absence of fever does not exclude infection from COVID-19.

## 2 | MATERIALS & METHODS

A new generation of voice/audio analysis application which can tell whether the person is suffering from COVID-19 is developed.<sup>5</sup> The voice samples can be used to find out the corona patients.<sup>6</sup> The software will be developed that can tell whether a person has corona by machine learning technique and artificial intelligence.<sup>7</sup> Using machine learning algorithms to detect corona with the audio sample is a new model which can have the accuracy of around 99% to find out the hidden causes of COVID-19 patients in the hotspot areas.<sup>8</sup>

## 3 | RESULTS

The sound made by coronavirus patients is so specific that we can reveal who has the disease.<sup>9</sup> An audio sample of COVID-19 patients such as the sound of the cough, a pattern of breathing, respiration rate, way of speech, intervals of their breathing will be recorded.<sup>9</sup> Data will be used for machine learning algorithms that analyse the audio sample for

the symptoms of COVID-19. Artificial intelligence application needs to consider multiple sound as signals to understand subtle variations in speech to suggest same one are infected with COVID-19 or not. Breath sound may sound clear & fast as the disease progress; we hear the faint wheezing having prolonged expiratory phase, having high or low pitch. In case of mild corona infection, patients may auscultate fine, crackles, high pitch and having popping sound like firewood burning in a fireplace.<sup>10,11</sup> Whereas in severe corona patients, sounds will be similar to acute respiratory distress syndrome (ARDS).<sup>12,13</sup>

Coarse rales with diffuse rhonchi will be observed in corona patients. Coarse rales have a low pitch, popping and bubbling whereas in rhonchi there is continuous low pitch, rumbling and gurgling.<sup>12,13</sup> The corona patients have cough sounds for a continuous half-hour with two cough sounds.<sup>14,15</sup> Each episode lasts for 15-30 seconds.<sup>14</sup> The presence of mucus and phlegm, the sound of sneezing and runny nose mean patients are not suffering from COVID-19.<sup>15</sup> The corona patients have dry cough very consistent sound. They were triggered by a tickle in the back of the throat with a barking or hoarse sound.<sup>14,16</sup> There will be a wheezing sound if lungs or intercostal muscles are injured resulting from COVID-19.<sup>16</sup>

Figure 1 shows the plan layout for audio analysis for preliminary diagnosis of COVID-19 patients. The collection of the audio sample will be done from the already suffered COVID-19 patients in (.Wave files) personally or through phone calls. The audio samples such as

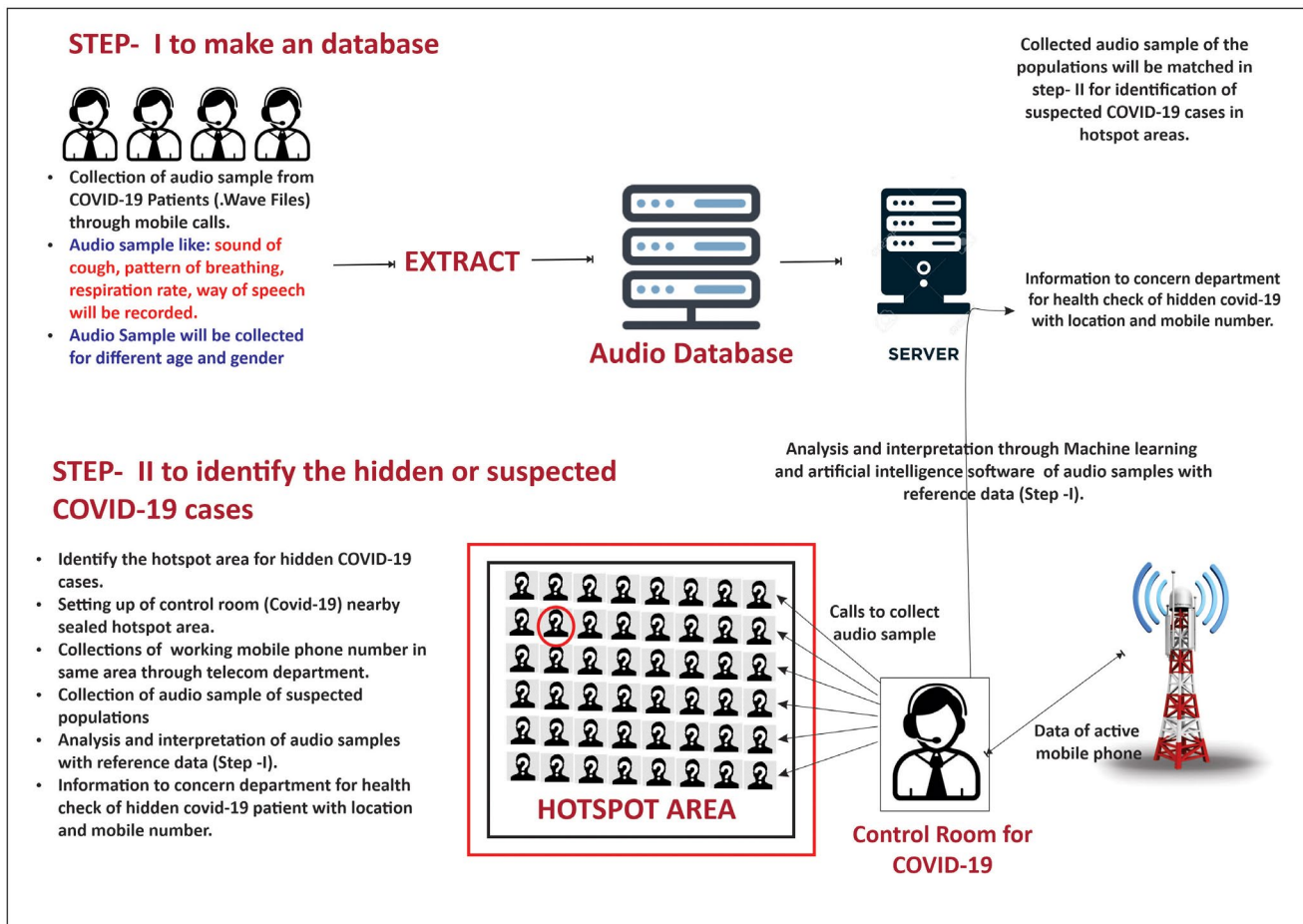
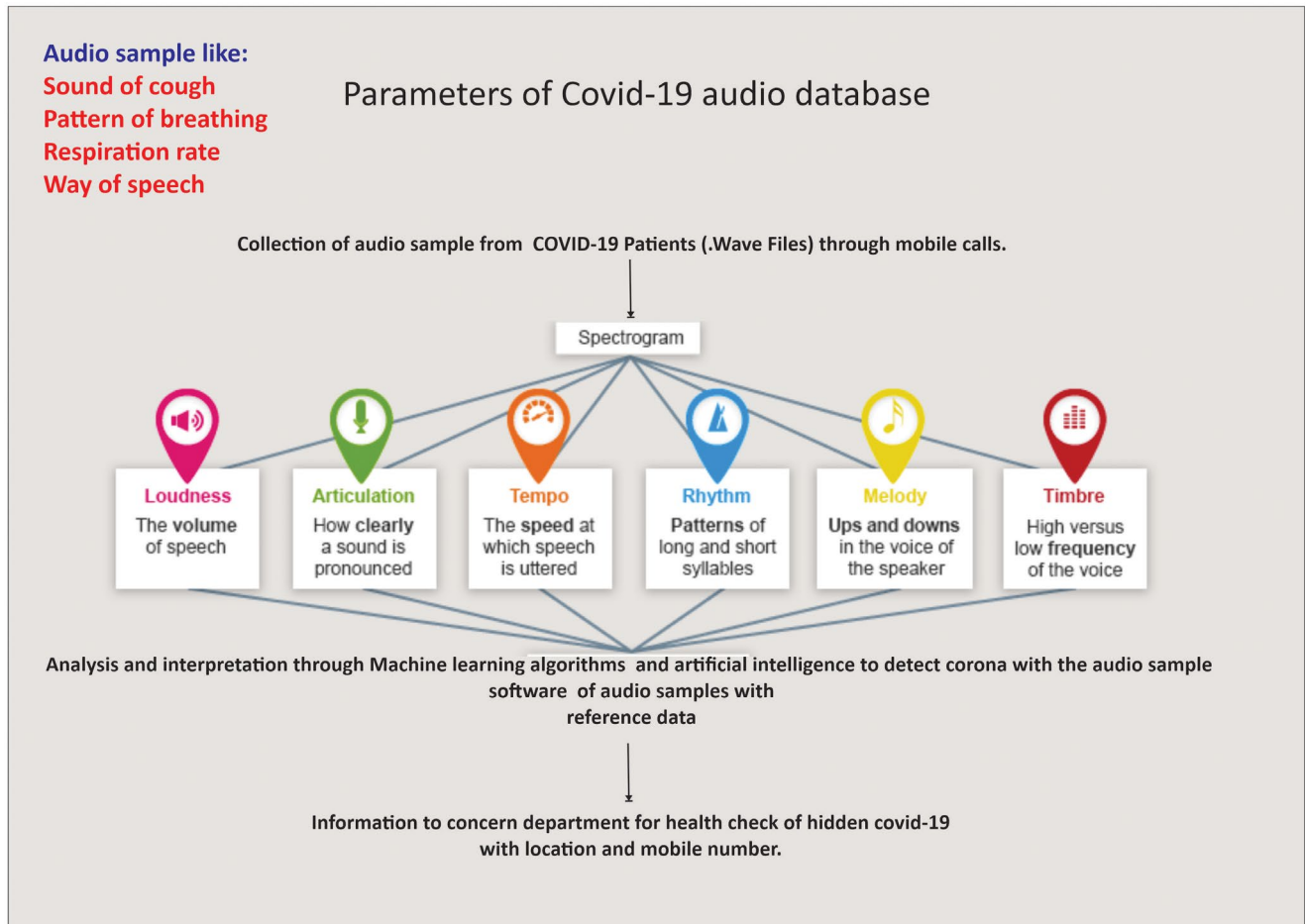


FIGURE 1 Plan layout for audio analysis for preliminary diagnosis of COVID-19 patients



**FIGURE 2** Parameters of COVID-19 audio database

the sound of the cough, the pattern of breathing, respiration rate and way of speech will be recorded. The audio sample of patients having different demographic will be collected. The obtained data can be added in a data-based server which can be used for further analysis. The process and method of step II which are to identify the hidden or suspected COVID-19 cases are shown in Figure 1.

Figure 2 shows the parameters of COVID-19 audio database, which includes audio sample, the sound of the cough, pattern of breathing, respiration rate and way of speech. All parameters will be evaluated for loudness, articulation, tempo, rhythm, melody and timbre. The analysis and interpretation of the parameters can be made through machine learning and artificial intelligence to detect corona cases with an audio sample. The data obtained by this method can be used as reference data. The information regarding the audio database will be shared with concern departments for health check of hidden COVID-19 cases with location and mobile number.

## 4 | DISCUSSION

This new generation of voice/audio analysis application work is to identify the suspected COVID-19 hidden cases in hotspot areas with the help of an audio sample of general public.<sup>9</sup> The voice/audio

application current project can be merged with a mobile App called 'AarogyaSetu' by the Government of India. The project can be implemented in the high-risk area of COVID-19 in the country. Another advanced feature of the new generation of voice/audio analysis application is to find out the general public who is most at risk of COVID-19 with the help of sign and symptoms developed.

Scrutiny of the COVID-19 patients by this method can enhance the percentage up to 50-60. We will be closer to the suspected cases which will help to decrease the cost of utilisation of the COVID-19 testing kits. India is still waiting for the rapid testing kits from abroad. The current test, which is available in India, has conducted in very few places and takes up to 3-4 hours for the results.

## 5 | CONCLUSION

This new method of detecting cases will decrease the workload in the COVID-19 laboratory. Firstly, we can screen the patients through this app, if found suspected patients than we can proceed for the diagnosis of the COVID-19 patients through test kits for further confirmation. There is no chance of infection to healthcare professionals, as no direct contact or physical contact with the patients.

## 5.1 | Cost break up for setting voice/audio analysis application

The cost for the workforce can be up to 100 000/- INR and travel collection of the audio sample can be up to 600 000/- INR, whereas the server and software cost can be up to 150 000/- INR and setting up a control room in hotspot area with other facilities will be 150 000/- INR (Each). The total cost for the whole voice/audio analysis application will be 10 Lacs. Approx.

### DISCLOSURE

The authors have declared that no competing interests exist.

### AUTHOR CONTRIBUTIONS

AS written the manuscript and behind the idea and novel invention. AB and DKS are the major contributors in writing and drafting the manuscript. All the authors read and approved the final manuscript.

### STATEMENT OF ETHICS

Not Applicable.

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