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Letter to the Editor

## Rapid sputum testing and not thermal screening alone should be the first-line screening test at airports: A Bayesian analysis



## Keywords:

COVID19  
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Sputum  
Thermal scan

Dear Sir,

We would like to bring to your attention the lacuna associated with the screening technique employed at all airports to identify suspected individuals infected with COVID-19 (Coronavirus disease 2019) caused by SARS-CoV-2 (severe acute respiratory syndrome coronavirus 2).

What we all know from available data:

- Thermal screening at airport has 54% COVID19 detection rate [1].
- 72% with COVID19 infection have their sputum tested positive [2].
- 3.5% individuals with sputum positivity will not have disease [3].

With the availability of rapid testing techniques with RT-PCR from sputum or throat/nasal swab [4], the automatic question which arises is how would this new technique improve the screening accuracy? Recent data clearly points at a directly proportional relationship between testing frequency and reduction in adverse outcomes from COVID19 [5]. In view of this finding it is of utmost importance to employ a screening technique with a probability of detection much higher than 54%.

We performed a Bayesian inference analysis to answer the question-what is the probability an individual has the disease given sputum is positive –  $\Pr(Ds|Sp^+)$ ?

With the available background information [probability of having the disease-  $\Pr(Ds)$ , probability of sputum being positive given an individual has the disease –  $\Pr(Sp^+|Ds)$  and probability of having sputum positive in the absence of the disease-  $\Pr(Sp^+|\sim Ds)$ ], we employed Bayes theorem to assess the probability of having the disease given the sputum test was positive-  $\Pr(Ds|Sp^+)$ .

To get clarity of the situation prior to analysis, we present the data in a tabular format:

Bayes theorem =  $\Pr(Ds|Sp^+) = [\Pr(Sp^+|Ds)*\Pr(Ds)]/\Pr(Sp^+)$

Putting in the values from the table:(Table 1)

$$\Pr(Ds|Sp^+) = [0.72*0.54]/0.406 = 0.957$$

There was a 95.7% probability the individual has the disease when sputum test was positive.

The drawback however is the lack of standardization of the kits as well as the lack of consensus on the exact reference ranges required to rule in or rule out the disease. Another area of concern is that approximately 48% of the patients who were sputum negative had a diagnosis of COVID19 confirmed by CT scan, which seems to have a better diagnostic yield than sputum RT-PCR. A third point of concern is the absence of cough and hence productive cough in the early as well as in the convalescent period. Hence, screening with sputum might become a challenge in these situations. A recent report from China recommends RT-PCR testing on induced sputum samples (induced with 10 ml of 3% normal saline inhaled through a mask with oxygen flowing at 6L/min for a duration of 20 minutes or until induction of cough) [6]. Sample collection in the form of sputum or induced sputum was found to have a better yield as well as was deemed safer for the health-care workers compared to obtaining throat or nasal swabs. However, the logistics and patient discomfort associated with sputum induction remains a very big challenge especially for large scale screening purpose. In such a scenario obtaining a throat or nasal swab along with thermal screening could be a better alternative.

In view of the significant increase in the probability of case detection, we suggest complementing the thermal scan screening technique with the rapid sputum testing with RT-PCR method, in addition to fortifying the holding area with masks, hand washing facilities, appropriate gears for health-care personnel as well as paramedical staff, isolated demarcated area for selective testing and transport facilities. In cases where individuals present without productive cough thermal screening with throat or nasal could help improving the diagnostic yield.

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## Declaration of competing interest

None.