



COMPARISON OF CLINICAL , RADIOGRAPHY AND ANTIGEN TESTING FOR EARLY RECOGNITION OF COVID INFECTION IN THE EMERGENCY DEPARTMENT.

Medical Science

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ABSTRACT

Background: Covid 19 infection is a Pandora's box of symptoms . Despite being in the pandemic for more than a year, there is still a disturbing uncertainty in recognizing patients with covid infection. It is very important to identify the possible covid patients for the purpose of isolation, investigation and therapeutic interventions at the first contact in the emergency department.

Methodology: Records of patients who were suspected to have covid infection were retracted from the database of the emergency department after obtaining ethical consent. We compared the initial ED presentation , chest x-ray , high resolution CT chest scans and rapid antigen testing to the primary end point which was a positive RT PCR result. We aim to calculate the percentage of accuracy of different ways to predict coronavirus infection in a patient.

Results: Dyspnea , a continuous fever and myalgias were more common presentations . Initial radiographs within 3-5 days of illness were mostly normal . 40% showed lower zone infiltrates, mostly bilateral (right > left). Ground glass appearance was characteristically seen not before 5-7 days in 85% patients. Covid antigen testing could identify 65% of positive cases. 4% of patients had a positive rapid test but a negative follow up RT PCR report.

Conclusions: No single parameter or investigation is highly specific to rule out covid 19 infection. They should be used to complement each other. The rapid antigen test should be performed for each suspicious case followed by immediate RT PCR. We suggest the use of HRCT only for covid pneumonia .

KEYWORDS

nCovid 19, screening, emergency,

INTRODUCTION:

2019-nCoV virus has distressed mankind. Early identification and isolation , either self or hospital - based are the most trusted ways to prevent the spread of disease. The disease had started with respiratory symptoms and slowly encompassed every possible presentation in medical history. Various researchers had published their algorithms for easy identification of covid infection but still the disease is getting missed.

METHODOLOGY-

We have used the medical records of patients who presented to ED in 2020 . The patients were divided into 3 categories. A suspected covid was defined as a patient with symptoms or a significant history of exposure to covid positive case or a SpO2 below 95% while breathing room air. A probable covid was a suspected patient with radiographic evidence of covid infection. A confirmed covid was a patient with a positive antigen test. These three groups were matched individually to the gold standard RT PCR report for each patient. The symptoms were collectively scored using SARI protocol as defined in Table 1. A score below 5 was further evaluated in ED, a score above 5 and patients with history of contact with covid positive case or an international travel in previous 14 days were sent to designated covid triage of hospital. The significant findings on CXR to rule in for a probable covid infection bilateral, peripheral and lower zones infiltrates, consolidations and ground glass opacities. Lobar involvement and pleural effusions were not considered to be covid during initial screening. Atolls sign or subpleural consolidations on HRCT were considered highly significant. The rapid antigen test kits used in our patients was standard-Q Rapid antigen test SD-BIOSENSOR Healthcare private Ltd® . It was essential that all patients included in our data went through the stages of suspected, probable and confirmed in the defined order. Only the patients with a strong history of positive contact were allowed to get a rapid test done alongside Chest radiograph. The details of their RT PCR test was collected subsequently from covid register.

SARI questionnaire protocol -TABLE 1

Sno.	Symptom	Score
1	History of cough	1
2	History of cold	1
3	History of diarrhoea	1
4	History of sore throat	1
5	History of myalgia/body aches	1
6	History of headache	1
7	History of fever (37.8 degree celsius and above)	2
8	History of fatigue	2
9	History of shortness of breath	4
10	History of international travel after 25 th Jan 2020 by patient or family members	Yes/No
11	History of direct contact/ taking care of COVID-19 positive patient by him or his family members	Yes/No

RESULTS-

The total number of patients who sought emergency services in 2020 were 14068 with 68% being males. 9086 patients (64.58%) were identified as suspected covid and were further investigated according to the protocol. 1758 patients who had SARI score above 5 whereas 908 patients had a positive finding on chest radiograph. The Remaining 1330 patients were identified after rapid antigen testing. They had performed poorly on the SARI questionnaire and their chest radiographs were equivocal. The RTPCR report was positive in 47.95% of patients with high SARI surveillance score, 76.8% of patients with abnormal lung findings on CXR and 98% of positive antigen tests.

The results are further discussed under subheadings and illustrated in Table 2 -

1. Age- The youngest patient was 12 years of age with a history of exposure and the oldest was 96 years with severe SOB. Across all

- ages, it was noticed that during the first wave, patients younger than 60 years were more affected. Our analysis also shows 68% of patients were below 60 years and above 60 years, 82% were below 75 years of age.
- Gender - men were more affected with covid 19 infection in 2020.
 - Symptoms - The symptoms like dry cough and malaise were more common in the younger population. SOB was the most common presenting complaint (younger > elderly). History of fever was equally common over both age groups. Strokes, intracerebral bleeds and seizures were seen more in elderly age group. Bell's palsy was seen more frequently in younger patients in the age group 20-30 years. Abdominal complaints had an equitable distribution. Younger patients, especially females also presented with catastrophic vascular complications like pulmonary thromboembolism and acute limb ischemia.
 - Arterial O₂ saturation- The cut off for noticeable desaturation was 94% for those below 60 years and 92% for above 60 years. Higher numbers of patients had low SpO₂ at time of admission in younger age groups. The elderly patients 3% were shifted on ventilatory support from other hospitals.
 - Presence of comorbidities- DM was seen in 71% of potential covid population. This was followed by hypertension, self medication with steroids prior to admission and chronic kidney disease, both were more common in the younger population. The presence of COPD and CAD were more common coexisting medical illnesses in elderly patients.
 - History of direct contact with covid positive cases. Only 65 of our patients had accepted nursing or coming in contact with covid affected patient.
 - Chest x ray at Triage- Most of the films were AP films as a portable X Ray machine was deployed for suspected covid cases. Abnormal cxr findings were seen more in the younger population in 21% of patients. A right lower zone infiltrates were commonly seen, though were not considered significant.
 - High resolution CT scanning- this was performed in probable patients who had not tested positive on an antigen test. The reports were read by radiologist and Corads score of 4 and 5 were sent to covid triage. 90% of patients with respiratory symptoms had covid associated findings on CT.

Table 2-

PARAMETER	AGE 18-60 years Number of patients	AGE >60 years Number of patients	males
Number of suspected covids with SARI score > 5	1105	653	1278
Number of patients who had possibility of alternate diagnosis	3044	4294	6111
Number of potential covids with bad cxr score	587	321	632
Number of confirmed covids with positive rapid antigen test	919	411	834
Median age with IQR	43 (22- 57)	74 (63-86)	-
SARI score (median)	7	6	-
qCSI score	9	7	-
Patients who presented on ventilatory support	5	11	13

DISCUSSION-

Covid infected patients can have no, minimal or severe symptoms. Only symptomatic patients would reach out for medical help but it is essential to segregate the suspects from the community to prevent the spread. Emergency physicians by the virtue of their job profile as frontline warriors played an important part in early screening and triaging of covid patients.

The SARI surveillance score [1] helped us to streamline the triaging of possible covid patients. It can be critiqued as it gives more importance to respiratory symptoms, fever ($\geq 100.4^\circ\text{F}$) and presence of fatigue in descending order of appearance. In our analysis, we found that 12% of patients tested positive by RTPCR who had low grade fever and mainly gastrointestinal complaints. Similarly, chief complaints in 9% of patients were neurological in nature. We can however add that high SARI surveillance score had longer ICU stay, long days on mechanical ventilation and a poor outcome. In total, symptom based screening had a sensitivity of 35% with a specificity of 66% in our analysis.

Similar to our observations, Yu shi et al [2] had published a host risk score of 487 patients outside Wuhan, China. They found that age more than 50, male sex, living in clusters and history of hypertension, diabetes, malignancy and cardiovascular diseases are high risk factors for susceptibility to covid 19 infection.

CALL score by Dong et al [3] triaged the sick covid patients based on comorbidities. Age more than 60, lymphopenia (count below 1000 per cubic mm) and LDH levels was proposed to identify the sicker patients early. However, logistically it is difficult to obtain WBC count and LDH levels within 4-6 hours in any emergency.

Ian Levenfus et al [4] has similarly proposed AIFELL score for early triage of covid patients. Altered smell or taste, Inflammation (CRP ≥ 30 mg/L), Infiltrates on CXR, Fever ($\geq 38^\circ\text{C}$), Elevated LDH (>400 U/L), Lymphocytopenia (absolute count < 1450) constituted the AIFELL score. This score also utilised laboratory investigations for triage purposes.

W Liang et al [5] had developed and validated covid gram score with 10 variables. Dyspnoea, hemoptysis, unconsciousness, NLR ratio and serum bilirubin were the new additions.

The qCSI or Quick Covid severity index [6] was also helpful in triaging the patients susceptible to covid 19 infection. The q CSI is most useful when evaluating patients who are presenting with some new O₂ requirements, work of breathing and hypoxia. It is not intended to replace clinical judgement. The simplicity of the scoring system contributes to easy applicability and robust generalisability.

Chest X-Ray (CXR) at first medical contact had gained immense popularity as a screening tool for covid 19 infection. Multiple studies [7] have defined the most probable pulmonary abnormalities in covid infection, it is advisable to take help of expert radiologists to look for infectious lesions associated with nCOVID-19. There is considerable overlapping of radiographic abnormalities with other infectious or autoimmune diseases. As our analysis was done within 48 hours of symptoms onset, we had only 21% patients exhibiting atypical consolidations on CXR. therefore, it is important to read the CXR findings based on the time from onset of covid infection. Thoracic imaging especially HRCT played an integral role in 'ruling out' COVID-19 pneumonia when RT-PCR is unavailable, pending or negative, or when clinical suspicion is 'low' based on other signs, symptoms and routine laboratory tests.

In view of its high specificity while relatively low sensitivity, ICMR [8] had recommended the use of Standard Q COVID-19 Ag detection assay as a point of care diagnostic assay for testing in healthcare settings in combination with the gold standard RT-PCR test. Suspected individuals who test negative for COVID-19 by rapid antigen test should be definitely tested sequentially by RT-PCR to rule out infection, whereas a positive test should be considered as a true positive and does not need reconfirmation by RT-PCR test.

Majority of the published trials focussed on recognizing the severity of covid to initiate appropriate treatment. Our study is unique to recognize the infected individual early on the background of diverse symptomatology and low sensitivity and moderate specificity of the investigations.

CONCLUSION-

No single symptom or test is 100% sensitive or specific to identify covid 19 infection. They should complement each other for correct identification and isolation of all suspicious patients is the most important chain in stopping the spread of virus. Even if RT PCR is negative, it is highly advised to isolate the symptomatics for at least a week. The patients in the emergency department should not be mixed and proper segregation should be done. The chest radiography facility, resuscitation rooms, and triage area can be moved to locations outside the ED, and a new surveillance protocol of multi through approach of symptoms with RAPID testing and early HRCT should be applied to determine the factors warranting quarantine. We propose that hospitals should develop a covid suspect area before the third wave along with the covid positive areas so that no suspect can be sent back to society before covid is actually ruled out.

REFERENCES-

- <https://www.who.int/publications-detail/surveillance-strategies-for-covid-19-human-infection>.

2. Shi Y, Yu X, Zhao H, Wang H, Zhao R, Sheng J. Host susceptibility to severe COVID-19 and establishment of a host risk score: findings of 487 cases outside Wuhan. *Crit Care*. 2020;24(1):108.
3. Dong Ji, Dawei Zhang, Jing Xu, Zhu Chen, Tieniu Yang, Peng Zhao, Guofeng Chen, Gregory Cheng, Yudong Wang, Jingfeng Bi, Lin Tan, George Lau, Enqiang Qin, Prediction for Progression Risk in Patients With COVID-19 Pneumonia: The CALL Score. *Clinical Infectious Diseases* 2020; 71(6):1393–99.
4. Levenfus I, Ullmann E, Battegay E, Schuurmans MM. Triage tool for suspected COVID-19 patients in the emergency room: AIFELL score. *The Brazilian Journal of Infectious Diseases*. 2020;24(5):458-61.
5. Liang W, Liang H, Ou L, et al. Development and Validation of a Clinical Risk Score to Predict the Occurrence of Critical Illness in Hospitalized Patients With COVID-19. *JAMA Intern Med*. 2020;180(8):1081–89.
6. Rodriguez-Nava G, Yanez-Bello MA, Trelles-Garcia DP, Chung CW, Friedman HJ, Hines DW. Performance of the quick COVID-19 severity index and the Brescia-COVID respiratory severity scale in hospitalized patients with COVID-19 in a community hospital setting. *Int J Infect Dis*. 2021;102:571-576.
7. Cleverley J, Piper J, Jones M M. The role of chest radiography in confirming covid-19 pneumonia *BMJ* 2020; 370 :m2426.
8. [https:// www. icmr.gov.in](https://www.icmr.gov.in/) /Advisory on utility of rapid antigen test for covid 19infection, dated jun 14, 2020.