



COVID 19 – Laboratory Scenario

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ABSTRACT

Coronavirus is an RNA virus, positive stranded, and enveloped was first isolated in 1965, can cause symptoms like common cold, severe respiratory symptoms, gastrointestinal, liver and CNS symptoms. WHO announced the original name of coronavirus as COVID 19 in December 2019. This virus has been named as Severe Acute Respiratory Syndrome cov 2 currently and WHO has now declared this virus as emergency of public health concern. More than seventy thousand people in China and 25 other countries have been infected. The confirmed cases of Covid 19 Infection, up to 14th April, 2020 in India were 11,487 and out of which 393 have been deceased and most number of cases were found to be confirmed in Maharashtra (2,684). Animals like camels, cattle, cats, bats probably serve as hosts for coronavirus. Various laboratory investigations like CBC, Real Time-PCR, D-dimer levels, cell culture, electron microscopy, Low platelet count, ESR, CRP levels, Chest CT, X ray, Liver and Kidney Function tests, SOFA (sequential organ failure assessment) score have been useful in diagnosing the causative agent. Since no antiviral treatment has been effective till now, so the transmission can be slowed down by preventive measures like self quarantine, isolation, maintaining distance from one another and use of personal equipments.



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INTRODUCTION

Background

Structure

Corona virus belongs to family coronaviridae : is an RNA virus, positive stranded, and enveloped of ca. 27000 - 31500 nucleotides present (William *et al.*, 2007), For an RNA virus, this family is the

largest known genome. Corona means crown in Latin, so this virus when visualised under electron microscopy gives the appearance of coronavirus virions, membrane of virus gives projections in form of spikes, which gives the resemblance of a crown. Coronavirus in humans was first isolated in 1965 from discharge of nasal cavity of patient having common cold and termed as B 814. This virus shares similarities regarding organisation and expression of the genome; in open reading frame encodes 16 non structural proteins. At the 5' end, 1 a/b is present, followed by proteins mainly : Spike Protein, Envelope Protein (E), Membrane Protein (M) and Nucleocapsid (N) encoded by other open reading frames at the 3' end. Different strains known to infect humans are currently 6 including : Human coronavirus 229 E, OC 43, NL 63, HK U1, SARS coronavirus and MERS coronavirus (Su *et al.*, 2016). SARS cov 2 shares similarities to some of virus generas, mainly beta subtype found in bats (Adhikari, 2020). 229 E and OC 43 are the viruses from alpha and

beta lineage that cause fifteen to twenty nine percent of all common cold (Su *et al.*, 2016). Coronavirus presents as common cold, severe respiratory symptoms, gastrointestinal, liver and CNS symptoms (Adhikari, 2020).

History

WHO used a term novel coronavirus on December 29 2019, in reference to virus that was responsible for affecting the respiratory system of patient in Wuhan suffering from Pneumonia. Officially; Novel coronavirus as Coronavirus disease (COVID 19) was announced by WHO and Severe Acute Respiratory Syndrome cov 2 (SARS- Cov-2) as the current name of virus. It was confirmed by WHO that the local seafood market place in China, Wuhan was associated with the outbreak of coronavirus epidemic but no specific animal was identified in association with this disease (Adhikari, 2020).

Epidemiology

During mid December 2019 in Wuhan, the outbreak of this disease started and up to February 18, 2020, more than seventy thousand people in the China and 25 other countries had been infected (Yu, 2020).

2.2 to 3.3 is estimated basic reproductive number and 2.3 % as its mortality rate. Five thousand five hundred and forty four cases have been reported as of March 6, 2020, including 159 death (Lescure, 2020).

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Animals like camels, cattles, cats, bats probably serve as hosts for coronavirus (Adhikari, 2020).

MODE OF TRANSMISSION

Animal coronaviruses don't spread among humans generally with the exceptions of some like Severe Acute Respiratory Syndrome cov 2 and MERS which transmit mostly via respiratory droplets (via coughing or sneezing) through close contact with infected people (Adhikari, 2020).

Three main routes have been described as a route of transmission for Covid 19 according to new guidelines from health authorities in china as following,

1. Droplet transmission
2. Transmission through contact
3. Aerosol

One study indicated the potential transmission route for this virus infection as the digestive system

in addition to these routes (Adhikari, 2020).

Laboratory Scenerio

Laboratory findings and investigations play a very important role in diagnosing the disease.

Molecular Profile

Procedures suggested for suspected patients are, Real Time PCR (RT-PCR)

For detection of the viral RNA in samples of lower respiratory tract like in sputum, throat swabs etc (Adhikari, 2020).

Specimen collection should be done and all specimens should be regarded as potentially infectious. Respiratory material should be collected at minimum.

Microbiological Profile

Upper Respiratory Tract Specimen

1. Nasopharyngeal swab.
2. Oropharyngeal swabs and
3. Washes in patients who are able to walk around but not bedridden

Lower Respiratory Specimen

1. sputum for endotracheal aspirate.
2. BAL (3).

Blood, stool, urine specimens should also be collected (6). Specimens should be transported to test centre immediately after sample collection with correct handling during transportation lab testing and confirmation with NAAT should be done followed by serological testing viral Sequencing and viral culture (World Health Organization, 2020).

Hematological Profile

1. Complete Blood Count.
2. Platelet count
3. ESR levels

Biochemical Profile

1. CRP
2. Lipid profile.
3. D- dimer level.
4. Procalcitonin.

5. Liver Function Test (LFTs)
6. Kidney Function Test (KFTs)
7. Potassium level.

Pan et al conducted a study, involving twenty one patients (71% women, from age ranging from 25 to 63 years) and frequent abnormalities reported as : Increased values of CRP, ESR, LDH and D dimers (Lippi and Plebani, 2020).

Wang et al studied the behavior of 6 laboratory parameters in 138 patients having Covid 19 infection and out of them, 33 were having a severe disease and noted significant differences between patients who needed ICU admissions and those who did not encompassing: High WBC count, Neutrophilia, lymphocytopenia, High LDH, Total Bilirubin, Creatinine, D-dimer and Procalcitonin (Lippi and Plebani, 2020).

Biomarker which is independently associated with severity of the disease and mortality risk is Platelet count. It is also very simple as well as readily available. In up to fifty five percent of patients in disease outbreak, low platelet count was found and it was considered as a risk factor regarding mortality rate. G Lippi et al conducted a meta analysis including 1779 patients, 399 with severe disease and concluded that the patients who didn't survive had a significantly lower platelet count than the survivors (Lippi et al., 2020).

Investigations like potassium levels can be a reliable, in time and sensitive biomarkers in patients with severe infections. D Chen et al conducted a study and found that body temperature, CK, CK-MB, LDH and high levels of C Reactive Proteins were significantly associated with a severity of low levels of potassium (Chen et al., 2020).

Some findings like high SOFA score (a score for assessment of sequential organ failure), D-dimer levels > 1 microgram per mili litre can tell about poor prognosis at an early age. Fei Zhou et al conducted a study in which 191 cases were taken and divided them into two groups : survivors =137, non survivors = 54 and concluded that old age, high SOFA score and d dimer levels more then 1 microgram per ml were associated with high risk of mortality. Findings associated with death were like : Lymphopenia, lymphocytosis, Elevated LDH, cardiac markers like cardiac troponin 1, Creatinine Kinase, d dimer levels, Serum Iron, Interleukin 6, Prothrombin time and Procalcitonin (Zhou, 2020).

An important investigation in suspicion of Covid 19 infection are the levels of CRP. The extent of lung

lesion and disease severity are reflected by levels of C Reactive Proteins providing an important clinical evaluation index (Wang, 2020).

L. Wang et al conducted a study in 27 positive patients and found that levels of C Reactive Proteins were correlated positively with lung lesions and reflected the severity of disease at early stages of the disease (Wang, 2020).

Radiological Profile

1. Chest CT
2. Chest X ray

Chest radiographs show features of ARDS, ranging from intermediate to advanced stages (Wang, 2020). Lung and immune system damage are the main pathological changes.

Fibrin exudates of serous type, clear membrane formation in lung alveoli, with the congestion and edema. In early stages, CT imaging reveals small, multiple patchy shadows, stromal changes with lung exudates, which develop as multiple ground glass and infiltrating shadows in both lungs (Wang, 2020).

Sana Salehi et al. conducted a study in which 919 patients were taken for study and found characteristic pattern and distributed of CT findings as Ground Glass Opacities (88%), both lungs involvement (87.5%), and Multilobular involvement (78.8%). Terlobular thickening of septa, Bronchiectasis, thickening of pleura with involvement of subpleura were Other CT findings. In setting of strong clinical suspicion for Covid 19 diagnosis, chest CT along with laboratory testing may be beneficial (Salehi, 2020). Sensitivity of CT Scan alone for the diagnosis was 76.4 % (Wang, 2020).

Cynthia S goldsmith et al. gave a report which describe the events in which virus was isolated as well as identified by electron microscopy (Goldsmith, 2013).

This study tells about various lab findings and investigations which have been used for diagnosing the etiological agent and also tells about various important investigations which should be done for screening for better outcome of the patients suffering from this disease.

There is no specific treatment confirmed to be effective against this virus till date, so symptomatic treatment with supportive care has been recommended regarding the patients which have been infected with Covid19 (Adhikari, 2020), along with some preventive measures to slow down the transmission of infection like isolation of cases, disinfection

of environment and use of personal equipment for safety (Adhikari, 2020).

CONCLUSION

This study give a brief idea about the disease including its epidemiology, mode of transmission, various laboratory investigations and findings, preventive measures etc. Most studies have given their views on epidemiological and potential causes and many more studies are still endeavouring to explore the prevention, safety and control measures. However further research should be done to provide reliable and valid measures to face this type of problem in short term as well as long term.

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Conflict of Interest

The authors declare that they have no conflict of interest for this study.

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