World Journal of Pharmaceutical and Life Sciences
WJPLS
www.wjpls.org
SJIF Impact Factor: 6.129

A COMPREHENSIVE OVERVIEW OF COVID-19 DIAGNOSIS

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Article Received on 23/02/2020 **Article Revised on 13/03/2020** **Article Accepted on 03/04/2020**

ABSTRACT
The novel coronavirus disease (COVID-19) was first occurred in Wuhan, Hubei Province, China in December 2019. Up to March 29, 2020, about 5,66,000 cases have been confirmed in which 25,000 people died all over the world. Internationally, it spread in 199 countries of 5 continents. Though there is no treatment with vaccine, but some promising drugs are using in different places. Delay of diagnosis may cause the disease progression rate higher. To minimize the death toll, it is important to diagnose the patient as early as possible with multiple analyses. CT scan, antibody detection and biochemical parameter analysis can be possible way to diagnose COVID-19 early.

KEYWORDS: COVID-19, diagnosis, RT – PCR, CT – scan.

INTRODUCTION

In December 2019, unexplained cases of pneumonia reported in Wuhan, China. Then, WHO initially named this new virus 2019-nCoV. On January 30, 2020, WHO announced the 2019-nCoV epidemic a public health emergency of global concern. COVID-19 is the third known coronavirus after SARS and MERS. Benvenuto *et al.* showed that the SARS-CoV-2 was only closely related to the coronavirus isolated from Chinese chrysanthemum-headed bats in 2015. They suggested the theory that the transmission chain started from bats to humans.[1] Recent studies suggest that the sequence homology between SARS-CoV-2 and SARS-CoV was 79.5%. So this evidence strongly suggested that the SARS-CoV-2 was derived from bats. On Feb 23, 2020, the number of people diagnosed with COVID-19 in China was 1879 times of that on January 10, 2020. The median age of death was 75 years, the median time from the first symptoms to death was 14 days. These findings suggest that the disease may progress in the elderly.[2]

Coronaviruses are enveloped with positive-stranded RNA viruses that belong to the family *coronaviridae*. Human coronaviruses lead to an upper respiratory tract infection. The disease is transmitted in in human mainly via animals which serves as intermediate hosts. The whole genome sequence of viral RNA extracted from host cell-depleted nasopharyngeal and sputum samples has shown that the novel virus is phylogenetically related to SARS-related coronaviruses. SARS-COV-2 has similar nucleotide identity 79% amino acid 94.8% to SARS- COV-A. It identifies spike protein associated to virulence about 76.2% and its genome sequence is similar to the Bat species about 87.5% from which envelope small membrane protein is about 100% identical.[3] Diagnosis of COVID-19 is an important issue because proper diagnosis can lead to treatment. As this corona virus shows flue like symptoms, it is indispensable to diagnose properly. RT – PCR is a widely used technique for the diagnosis of COVID-19. Moreover, CT scan is also used to diagnose this disease. Both methods have some advantages and disadvantages. In this review, we summarized the findings of recently used RT – PCR, CT scan and other diagnostic analysis.

RT - PCR

Deng *et al*, (2020) conducted an observational study on ocular detection of SARS-CoV-2 in 114 cases of COVID-19 pneumonia in Wuhan, China. They investigated the possible transmission of SARS-CoV-2 through the ocular conjunctival pathway. This study was important to find out the possibility of ocular transmission. In this study, authors collected nasopharyngeal swabs and conjunctival swabs from 144 COVID-19 pneumonia diagnosed patients at Tongji Hospital in Wuhan, China. From electronic medical records, the demographic, epidemiological, clinical, laboratory and outcome data were obtained and laboratory detection of SARS-CoV was performed by real time RT-PCR. The swab samples were maintained in viral transport medium and further analyzed by real time RT-PCR. In the result, it was found that the novel corona pneumonia had been in the community epidemic stage and most of the infected patients were in three generations. Also found that, there was need for improvement in the rate of timely hospitalization and

admission. Due to the delay of admission, patients with mild or normal disease may be aggravated to severe or critical disease. After testing nasopharyngeal swabs for SARS CoV-2 virus, 90% cases were positive. But when conjunctival swabs were tested, there was no viral nucleic acid could be detected in the samples of COVID-19 pneumonia patients.[4]

In another study, it was showed that the combination of SARS-CoV-2 nucleic acid test and clinical features of COVID-19 greatly affected the efficiency to control viral spreading and outbreak. For detection of causative viruses from respiratory secretions and final pathogenic diagnostics of COVID-19, quantitative real-time RT-PCR (RT-qPCR) has been widely used method. Recently, it was happened that before bronchoalveolar lavage fluid （BALF) was acquired, one SARS-CoV-2 infected patient was not confirmed by RT-qPCR testing for the first three times within three weeks but this patient was positive for SRAS-CoV-2 when results from both RT-qPCR and next-generation sequencing (NGS) testing. For this, several factors have been mentioned to explain the inconsistency or the high false negative rate (FNR). In the estimation of real COVID-19 cases from one-time testing, FNR was as high as 30% to 50%. For the best testing of SARS-Co V-2 infection, the quality of testing kit and standard operating procedure is urgent to rapidly optimize. It is also urgently recommended that samples should be used for viral infection testing from the lower respiratory tract of the patients, including sputum and BALF, although nasopharyngeal swab is more commonly used and easier. Sample reagents (for example, TRIzol has been proved for the stability of RNA samples and can inactivate viruses), sample transport condition, and laboratory practice standard should consider to further decrease high FNR.[5]

The Chinese government to take drastic measures to minimize the outbreak of this disease including the quarantine of millions of residents in Wuhan and other affected cities and encouraging citizens to stay and work from home, and so on. But these efforts are limited by one hard problem that is how to differentiate the COVID-19 cases from the healthy. There are several common clinical symptoms include fever, cough, myalgia or fatigue which are reported for confirmed COVID-19 cases. As these symptoms are not unique features of COVID-19 because these symptoms are similar to that of other virus infected disease such as influenza. Currently the virus nucleic acid RT-PCR test has become as the current standard diagnostic method for diagnosis of COVID-19. As these real-time PCR test kits have many limitations including time consuming (it generally takes on average over 2 to 3 hours to generate results), because of complication in operation the PCR tests require certified laboratories and trained technicians to operate also need expensive equipment. The most important limitation is some numbers of false negative results which makes RT-PCR unsuitable for use in the field for rapid and simple diagnosis and screening of patients. For this reason, there is an urgent need for a rapid, simple to use, sensitive, and accurate test to quickly identify infected patients of SARS CoV-2 to prevent virus transmission and to assure timely treatment of patients.[6]

RT - LAMP

Lamb *et al*, (2020) explored a way for rapid detection of novel coronavirus (COVID-19) by Reverse Transcription-Loop-Mediated Isothermal Amplification. They aimed to develop a rapid screening diagnostic test that could be completed in under 30 minutes and allow for faster and cheaper field based testing at point-of-risk. In this study, researchers used stimulated patient samples which were generated by spiking serum, urine, saliva, oropharyngeal swabs, and nasopharyngeal swabs with a portion of the COVID-19 nucleic sequence. The samples were tested by both RT-LAMP and conventional qRT-PCR. RT-LAMP was evaluated by also testing against other related coronaviruses (MERS, BtCoV, MHV). RT-LAMP specifically detected COVID-19 in stimulated patient samples and performed in under 30 minutes. RT-LAMP reaction required total 6 primers to work under the optimized condition and positive reaction could be observed by naked eye by a color change from orange to yellow. In this COVID-19 outbreak, it was difficult to diagnose early in infection as patients could remain asymptomatic or present with flu like symptoms. This virus had an incubation time of 2 days or up to 2 weeks after exposure. qRT-PCR was the standard for diagnostic molecular testing but it was expensive and time consuming. Moreover, it also needed expert personnel for testing. This study helped to improve this by developing a potential point-of-care test. This type of testing has several advantages for emerging infectious diseases like COVID-19 and might be easy to use, inexpensive, fast, and required little if any laboratory infrastructure while maintaining sensitivity and specificity. Authors proved that RT-LAMP met these requirements. So they said it has a large impact of screening and testing for COVID-19 in potentially exposed populations. Despite having several limitations, authors proved that RT-LAMP was a fast and robust assay for detection of COVID-19 in under 30 minutes. They suggested that this simple assay could be used outside of central laboratory on various types of biological samples and may provide a new diagnostic strategy for combatting the spread of COVID-19 at the point-at-risk. This study was very helpful and important to develop a new way of detecting COVID-19 in short time and also in an inexpensive way by limited amount of facilities.[7]

Biochemical parameters

A study mainly focused over the predictive factors of progression to severe disease to facilitate proper allocation of COVID-19 patients to different levels of medical facilities. For the study, 49 COVID-19 patients were collected, which were divided in two groups: stable non-severe and progressive to severe diseases. Among

them 34 (69.4%) had stable non-severe disease and 15 (30.6%) progressed to severe disease. The study mainly exposed the risk factors which are responsible for progressive to severe COVID-19 group, these are comorbidity, age >50, absolute lymphocyte counts <1500 /μL and serum ferritin >400 ng/mL. Researchers also mentioned that during their study only a patient had died who had all the risk factors.[8]

Tian *et al*, (2020) showed in a study compared the characteristics between severe and common confirmed cases which including mild cases, no-pneumonia cases and asymptomatic cases, the features between COVID-19 and 2003 SARS. 46 (17.6%) of severe cases, 216 (82.4%) of common cases, which including 192 (73.3%) mild cases, 11 (4.2%) non-pneumonia cases and 13 (5.0%) asymptomatic cases were found respectively. Fever (82.1%), cough (45.8%), fatigue (26.3%), dyspnea (6.9%) and headache (6.5%) are the common symptoms of COVID-19. The fatality of COVID-19 infected patients in Beijing was 0.9%, significantly lower than the whole national average level while the rate of discharged patients of Beijing was significantly higher than the whole national average level. Among the top 10 provinces and cities with confirmed cases of COVID-19, Beijing was successful in preventing and controlling on the COVID-19 infection. This success comes from the correct leadership and experience of SARS in 2003.[9]

In another study, 27 patients were initially affected, later the number rose to 41 and one death was noted. In February 3, 2020, at least 117,496 cases with death of 362 have been reported. Peak travel season was probably an important factor for the global transmission of this infection. Each patient can spread the infection to more than two healthy persons. Mild clinical presentations, lack of infrastructure in resource-limited countries are hurdles to control this infection. Plenty of morbid conditions present in hospital population which can worsen the condition. Mostly infected people were aged between 49 – 61 years. Presence of non-specific symptoms such as malaise, fever 98%, cough 76%, dyspnea 55%, and myalgia / fatigue 44% were seen. Other biochemical parameters include – elevated ALT / AST level (41%), high serum ferritin (63%) and high C reactive proteins (86%) were also observed.[10]

Antibody

Researchers developed a serum-based testing method which detects the SARS-CoV-2-specific immunoglobulin M from patients' sera. SARS-CoV-2 is spreading faster and initially COVID- 19 may present without symptoms, or sometimes including fever, coughing, shortness of breath, pain in the muscles, and tiredness. COVID- 19 may also develop into pneumonia and acute respiratory distress syndrome (ARDS), as SARS outbreak in 2003. The method which has been used to define cases in Hubei province having epidemiology history, clinical features including fever and/or respiratory symptoms; early onset of normal/decreased white blood cell count or decreased lymphocyte count along with sign of pneumonia.[5]

The rapid, simple, highly sensitive test for diagnosis of COVID-19 is testing of specific antibodies of SARS-CoV-2 in patient blood. IgM provides the first line of defense during viral infections and IgG responses are important for long term immunity and immunological memory prior to the generation of adaptive, high affinity. It was reported that after SARS infection, IgM antibody could be detected in patient blood after 3 - 6 days and IgG could be detected after 8 days. It can be assumed that the antibody generation process of COVID-19 is similar as the previous MERS and SARS because it belongs to the same large family of viruses as those that cause the MERS and SARS outbreak. So, the detection of the IgG and IgM antibody against SARS-CoV-2 will be an indication of infection. Furthermore, detection of IgM antibodies tends to indicate a recent exposure to SARS-CoV-2, whereas detection of COVID-19 IgG antibodies indicates virus exposure some time ago. It can be concluded that detection of both IgM and IgG could provide information about the time course of infection. The rapid detection of both IgM and IgG antibodies will provide valuable role to the diagnosis and treatment of COVID-19 disease. In this study, a point-of-care lateral flow immunoassay (LFIA) test product was developed, which can detect IgM and IgG simultaneously in human blood within 15 minutes. This product was applied in 8 hospitals and Chinese CDC agencies to validate its clinical efficacy. From this testing, it was found that this rapid combined antibody test has high sensitivity and specificity respectively sensitivity of 88.66% and specificity of 90.63%. It had also been confirmed that the detection sensibility was higher in IgG-IgM combined antibody test than in individual IgG or IgM antibody test. It can be concluded that the combination of nucleic acid RT-PCR and the IgM-IgG antibody test can provide more accurate SARS-CoV-2 infection diagnosis and by this we can minimize the severe outbreak and transmission of this disease around the worldwide.[6]

CT scan

COVID-19 can be confirmed by Reverse Transcription Polymerase Chain Reaction (RT-PCR) of blood or respiratory specimens. The detection rate is low by this process in early stages of disease and takes 1-3 days for confirmation of positive result. On the other hand, through the process of Chest Computed Tomography (CT) in diagnosis of COVID-19 shows high sensitivity. The speed of acquisition of CT and timely reporting can make diagnosis of COVID-19 within minutes. It can also monitor the improvement and disease progression in patients with COVID-19. In another study, 27 patients were initially affected, later the number rose to 41 and one death was noted. Upper respiratory tract sign and symptoms, chest X-ray and CT findings showed bilateral lung involvement in 114 of 140 confirmed patients.[10,11]

Another research focused on the imaging manifestations of this disease and spectrum of imaging findings. They discussed on the understanding of clinical and Chest CT features of COVID-19 that helps detecting early infection and assessing the course of the disease. This also disseminates the latest knowledge to frontline health workers to learn about COVID-19 and prevent further spread of this infection. They reported bilateral peripheral ground glass opacities (GGOs) of COVID-19 in radiology. In 40 cases, they found same CT findings in most patients. GGOs were bilateral in 91% patients, the involvements of posterior lungs were 85%, peripheral involvements were 86% of the patients, GGOs with interstitial and interlobular septal thickening in 75% of patients, with consolidation in 48% cases. On the other hand, chest CT or cardiothoracic imaging showed pure GGOs of 82% patients. By radiology the high GGOs early infection of COVID-19 confirmed.[12]

Wang *et al*, (2020) assayed the clinical and imaging evidence of Wuhan-viral pneumonia. They aimed to analyze and explain the clinical and imaging evidence of the Wuhan-viral pneumonia from a large scale prospective cohort study in order to enhance public emergency preparedness and response. In that study, from the 1st until the 22nd of January 2020, 887 patients were identified as having Wuhan-viral pneumonia. They prospectively collected and analyzed clinical and imaging data of patients with viral pneumonia, determined by the both clinical and CT imaging scan at Wuhan's largest hospital. There are 5 cases which described the whole clinical and imaging spectrum of the Wuhan-viral Pneumonia. In the result, 96.40% were outpatients, 3.60% were inpatients and 0.56% was admitted to ICU. The patients had various underlying diseases. Common symptoms of the patients were fever, cough, and discomfort. Less common symptoms were dizziness, fatigue, hemoptysis, chest pain, abdominal pain, dyspnea, back pain, headache, and palpitation. Infected patients had complications included respiratory failure, heart failure, shock and enteritis. Abnormalities in chest CT image were detected among all patients. None of them were died so mortality rate is zero. Among 5 cases, 1st patient had fever, blood pressure, palpitation, respiratory problem, decreased WBC, neutrophil, lymphocytes count. CT imaging scan also showed abnormalities. They didn't show any outer significant symptoms. But they had decreased WBC, neutrophil and lymphocyte count. They also showed CT imaging scan abnormalities. All of them were improved after treatment and discharged from hospitals. So, this study showed clinical evidence that Wuhan-viral pneumonia had a low fatality rate. Also, CT imaging plays a pivotal role in the screening, diagnosis, isolation plan, treatment, management or prognosis of patients with Wuhan-viral pneumonia. This study was helpful and important to understand the patient's condition, common problems, susceptibility, level of sickness, severity, cure time, etc. specifically.[13]

Coronavirus has a very high infectivity. So, it was very important to confirm the patients who infect the 2019-nCoV. They aimed to know the sensitivity of real-time RT-PCR assay, clarify more about the epidemiological and clinical characteristics of 2019-nCoV infection outside Wuhan. In this retrospective study, researchers included all suspected cases in Hunan Provincial people's hospital from 8th Jan to 8th Feb, 2020. They obtained epidemiological, demographical, clinical symptoms, laboratory test and chest CT image of all confirmed patients. They also collected throat-swab specimens from upper respiratory tract that were obtained from all patients. They examined other respiratory viruses and tested blood routine test, Procalcitonin (PCT), ESR, C-reactive protein (CRP) and chest CT. They analyzed the sensitivity of real-time RT-PCR assay, described the epidemiological history, demographics, symptoms of confirmed cases, and observe the laboratory test and chest CT images. In the result, researchers included confirmed positive 560 suspected patients with 2019-nCoV infection by real-time RT-PCR assay and the sensitivity of real time RT-PCR assay was 100%. They found, 3 confirmed cases were asymptomatic type and 3 confirmed cases were light type. But most of them were medium type and also there was a family cluster phenomenon. The real-time RT-PCR result was very specific. But this study had several limitations. First, it was a small number study with only 24 confirmed cases included. Then, more details of the patients were not available because of designated isolation. So, this study gave researchers another perspective to assess the epidemiology and clinical characteristics of 2019-nCoV infection outside Wuhan, Hunan province, China. 2019-nCoV was already surpassing SARS-CoV and MERS-CoV in the number of individual infected. It was rapidly spreading but the fatality rate was lower than both SARS-CoV and MERS-CoV.

Moreover, it could be asymptomatic type and light type. Close monitoring would be needed to prevent large scale spread of virus. So, faster detection was needed badly. That is why; Real-time RT-PCR was a very good method because of its high sensitivity.[14]

In another study, patients were diagnosed with real time RT PCR to detect the confirmed case of being affected with COVID-19 pneumonia were allowed to chest CT scan. It was done on 81 patients who were divided into 4 groups in two hospitals who were admitted between December 20, 2019 and January 23, 2020. The result showed abnormal lung condition which is similar to those of the SARS and MERS patients that includes bilateral and peripheral lung lesions, Ground Glass opacity (GGO) with ill-defined margins, air bronchograms, septal thickening, and thickening of the adjacent pleura. The right lower lobe is more prone to affected but both lungs are involved. Patients having comorbidities have a greater impact on generating the disease in male sex of average 49.5 years old. Symptoms

and Findings are associated with H7N influenza infection. There are common similarities with SARS and MERS in case of symptoms like fever, dry cough and dyspnea. They also develop other general symptoms with a various characteristic features. But asymptomatic patients are also found. The significant change is the conversion of unilateral lesion to bilateral lesion from group 1 to 2 and several other extreme conditions are growing cumulatively in group 3 and 4 with the symptoms onset beyond. Though there are some limitations, but radiographic feature can help to diagnose the developing stage of COVID 19.[15]

Another study explained about the difference between COVID-19 and other respiratory diseases. For the initial screening, Computed Tomography (CT) was needed and the disease was then confirmed by positive results of the nucleic acid amplification test (NAAT) of respiratory tract or blood specimens using Reverse Transcription Real Time Fluorescence Polymerase Chain Reaction (RT-PCR). After CT scanning of six different people diagnosed with high body temperature, it shows patchy pure ground glass opacities (GGOs) or lung white out. But after NAAT test through RT-PCR four of them show negative NAAT results and confirmed diagnosed with Rheumatic Pneumonia and Coronary Heart Disease. Chest CT scanning is irreplaceable in the preliminary screening of COVID-19 for its rapid, timely and high positive rate. Furthermore, NAAT results used as a confirmation even if sometimes it shows negative result but necessary for isolation measures to avoid the spread of the epidemic.[16]

Zhu *et al*, (2020) focused on the identification of characteristics including clinical features and pulmonary computed tomography (CT) features of heart failure and COVID-19. This was done by retrospective study. A total 7 patients of heart failure and 12 patients of COVID-19 were diagnosed and the clinical and imaging features of these groups were statistically analyzed. In COVID-19 group fever and respiratory symptoms were significantly higher but impaired cardiac function symptoms were lesser than the heart failure group. Both groups had ground glass opacities (GGOs) and thickening of interlobular septum but in COVID-19 group they were much higher. Heart failure shows several other symptoms including pulmonary veins, lesion distribution diagnosis but COVID-19 shows only fever and respiratory related dysfunctions.[17]

Early detection is important because there are no developed curative vaccines against this SARS-CoV-2. So, fighting against SARS-CoV-2 involves early detection which will also help in controlling transmission of this disease. As this disease has similarity of clinical symptoms with influenza A and B, makes it difficult to diagnose COVID-19 was laboratory detection test is proved to be inconvenient because of requirement of much time, huge number of suspected cases and shortage of test kits. CT scan is proved to be convenient in diagnosis of confirmed cases and helps in the evaluation of treatment progression. CT scan has also the potential for detection of highly suspected COVID-19 patients who give false negative results in RT-PCR assay. For this study, 101 confirmed COVID-19 patients were chosen and grouped into two groups, non-emergency and emergency. CT scan were done after admission, 14 characteristics features of CT scan, it was evaluated. Among the patients, 87 were two in non-emergency group and 14 were in emergency group (most of them were older than the patients in non-emergency group). CT scan of COVID-19 patients have some characteristics features like GGO, mixed GGO and consolidation, vascular enlargement in lesion. Eight patients have no abnormality in CT scan. Cavitation and tree-in bud were not present on any CT images of COVID-19 patients. The severity and extent of the disease can also be determined by CT scan. There are some limitations of CT scan like negative result can be found and detection of specific viruses is not possible and this study does account infection with others viruses.[18]

In a study, 51 patients were retrospectively analysed of which 51 was infected with SARS-CoV-2 and two patients with adenovirus infection. After CT scan 51 patients were diagnosed with viral pneumonia. But in CT scan observation, 49 of them showed the characteristics of COVID-19 and the remaining two showed that of adenovirus infection. So, the misdiagnosis rate in CT analysis is 2 in 51 (3.9%) patients. In CT scan was proved to be that GGO and consolidation was two main signs of COVID-19 lesions which are similar to that of SARS-CoV and MERS-CoV. CT scan of COVID-19 patients has some differences with that of SARS-CoV and MERS-CoV patients examples includes presence of a reverse halo sign (2 patients), pulmonary nodules with a halo sign (9 patients) and multifocal involvement. An interesting fact is that no COVID-19 patients have mediastinal lymphadenopathy. In CT scan of Adenovirus infected patients, one of the two patients have similar result as COVID-19 patients. As CT scan has the rapid diagnosis potentiality and low misdiagnosis rate thus it can be used as standard method for diagnosis of COVID-19 cases. Like all other techniques it also has some disadvantages like no identification of specific viruses and overlapping result with some disease that is caused by viruses other than SARS-CoV-2.[19]

A total 1099 patient's data was analyzed, the median age of these patients was 47 and median incubation period was 4 days. Among these patients 483 (43.9%) was residents of Wuhan, 72.3% of non-residents of Wuhan had contact with Wuhan residents. Patients were grouped into non-severe (926 patients) and severe (173 patients), severe group patients were older than non-severe group. CT scan shows abnormal result in 86.2% confirmed cases. The most characteristics features of chest CT were GGO (56.4%) and bilateral patchy shadowing (51.8%). Unfortunately, some COVID-19 patients showed no abnormal CT scan result (157 of 877 patients

approx..18%). Lymphocytopenia was present in most patients, some patients had thrombocytopenia and leukopenia also. C-reactive proteins were elevated in some patients. Severe patients had clinical abnormalities which was more prominent than non-severe patients. For treatment of this disease various strategies were followed like intravenous antibiotic therapy (58%), oseltamivir therapy (35.8%), oxygen therapy (41.3%) and mechanical ventilation (6.1%). Statistical analysis showed that mortality rate is 3.2% or even low. Early diagnosis, early isolation and early management might reduce mortality rate.[20]

From Jan 11, 2020, to Feb 5, 2020, the clinical, laboratory and HRCT features 31 of 42 patients (26-75 years, 25 males) with SARS-CoV-2 pneumonia were analyzed to quantify severity of severe acute respiratory syndrome coronavirus 2 (SARS-CoV-2) pneumonia on High-Resolution CT and to determine its relationship with clinical parameters. The disease is transmitted through respiratory droplet as well as physical contact. Computed tomographic (CT), especially high-resolution computed tomographic (HRCT), is quite necessary and indispensable for the definite diagnosis and re-examination. In the early stage of SARS-CoV-2 pneumonia, the clinical and imaging manifestations were particularly important and can be used to confirm the diagnosis, judge the changes in severity, adjust the treatment plan and infer the prognosis. They recruited 42 patients with nasopharyngeal or oropharyngeal swab specimens and their diagnosis of SARS-CoV-2 pneumonia were confirmed with a positive result by real-time fluorescence polymerase chain reaction assay. Clinical and radiologic study findings show that CRP, ESR and LDH positively correlate with the severity of lung abnormalities quantified on initial CT which is evaluated with Spearman correlation and linear regression analysis. Moreover, high fever is associated with an adverse follow-up CT outcome, which may add a further facet in the understanding of the clinical expression of this new viral infection.[21]

In another study, Zhao *et al*, (2020) classified the patients into four groups - mild type, common type, severe type and fatal type and for the purpose of treatment the patients were divided into two group emergency group and no-emergency group. Imaging Technique (CT Images) on lung, mediastinal and Imaging Interpretation involved for the clinical outcomes of the patients. During this study the patients were primarily treated with recombinant human interferon α2b (aerosol inhalation) and antiviral treatment, such as lopinavir or ritonavir tablets (500 mg twice daily, orally). Among the 118 patients 69.5% were less than 50 years old in addition with 2 young (2 and 11 years). 78% patients have an exposure history to Wuhan and 20.3% exposure to the patients. Most of the patients were experienced with fever (77.1%), cough (54.2%) and fatigue (19.5%). In most patients, ground-glass opacity (GGO) (85.6%) and consolidation (62.7%) were found. In most of the patient, vascular enlargement in the lesion (78.0%) on CT image also found. The abnormal CT findings were more likely to be peripheral distribution (82.2%), bilateral involvement (79.7%) and multifocal (55.1%). Some patients (8) were identified as negative findings on CT images. The mean score of the lung involvement at baseline was 6.18. 64 (54.2%) patients presented improvement CT changes, whereas 49 (41.5%) patients presented progress CT changes. 6 patients remained as the same CT findings during the treatment and 5 of 6 patients had no abnormal CT findings at baseline.[22]

CONCLUSION

Besides RT – PCR, CT scan together with serological and biochemical parameter analysis will lead the early detection of COVID-19 and will help to minimize the death toll.

ACKNOWLEDGEMENTS

We hereby thank to the department of Biochemistry and Molecular Biology as well as Jahangirnagar University for their support in this study.

CONFLICT OF INTERESTS

The authors declare no conflict of interests.

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