European Journal of Molecular & Clinical Medicine
ISSN 2515-8260 Volume 07, Issue 02, 2020

Molecular medicine in the current scenario of COVID-19; A clinical and radiological study

First Author:

Fahad Mohammed Alshehri, M.D.
Associate Prof of Medical Imaging Department
Medical college
Qassim University

Second Author:

Prof. SusanGilbert, M.D.
Professor of Medicine
New York Community Hospital
York Field University, Ny USA.

Abstract

Introduction: The field of molecular medicine includes radiology, Proteomics, genomics, and vaccinations. Ever since the onset of the COVID-19 pandemic, molecular medicine has played a significant role in regulating and predicting the virus's symptoms. The most optimal strategy for containing the epidemic is predicting the expected future conditions that the virus might bring. The records and accumulated data from the previously administered SARS-COV-2 virus cases have helped indicate the potential risks and biological alterations caused by the virus.

Aims and Objectives: The study aims to explore the contribution of molecular medicine during the COVID-19 pandemic. The research also evaluates the clinical and radiological images obtained from the administered patients. Such data assists in gaining familiarity with the outcomes of deadly viruses such as the COVID-19 virus. Furthermore, the research aims to review the current literature on the contribution of molecular medicine towards treatingthe COVID-19 virus.

Methodology: The research's selected method is a qualitative analysis of the literature on the radiological and clinical studies and examinations current from the previous and on-going

pandemic. The research also generated a curve elaborating on severity along the different stages of the virus. The course elaborates on the various steps starting from the pre-disease phase and including all grades up to the chronic phase.

Results: The study's superior outcomes involve highlighting the virus's severity along the different stages of the virus. Moreover, the research puts forwards four relevant studies that discuss the current classes and data on the clinical.

Conclusion: The contribution of molecular medicine in the COVID-19 virus is significant and can be recognized in multiple areas trying to regulate and examine its severity. The study focuses on formulating and finding relevant information regarding the clinical and radiological evaluation of the virus.

Introduction

The science of molecular medicine has shifted from genomics to proteomics, as proteins are the primary regulators of all cell functions—meanwhile, DNA stores all the necessary information and gene codes inside a body [1]. The cellular protein exists in complex interactions and pathways and forms very mainly designed protein-protein businesses. The proteins bind together at the detection of a specified stimulus in the form of a coalesce.

Proteomics and genomics from the field of molecular medicine aresignificantly precise. Theycan provide a detailedpicture of any patient's state and the internal biomedical functioning of an individual. Proteomics biomarkers are relatively more significant as they are observed more thanhuman transcripts for diseases such as COVID-19[2]. Besides, they are different for different diseaseconditions andprogressions, whereas the genome puts forward a"blueprint"for some cases, such as cardiac disease, acting as an indicator for risk.

The diagnosis for COVID-19 currently consists of two main approaches: immunoassays that detect antibodies for the viruses similar to COVID [15]. In samples and assays,the real-time reverse-transcription chain reaction, which can be performed through clinical specimens. These specimens include bronchoalveolar lavage fluid, sputum, pharyngeal swabs, or even feces.Here, other concerns are brought to the surface that demand for biomarker assaysarise [3]. Most

infected individuals from SARS-CoV-2 will show an immune response after a week of getting infected, whereas some individuals remain asymptomatic and some go through easy recovery.

There are 20,000 protein-encoding genes in the human body. There could be over 1,000,000 proteoforms such as variants of splices along with significant post-translational modifications (PTMs). The estimation is such that 29proteins for SARS-CoV-2,where (S, E, M, and N) are the main proteins [4]. Among such proteins, the S protein in COVID-19 patients has been observed to be glycosylated. Moreover, there is sufficient evidence to suggest that it occurs in the same manner in the SARS-CoV-2 [5] [16]. The proteomics of any sample include all the necessary information about a particular sample of wither cell. Plasma or even sputum. The proteomics can also quantify the major human proteins that are pathogenic elements in a sample. Proteomics enable us to identify protein patterns among various phases in a particular state of disease. The proteins in the human bodyis likely to alter the signal from proteins of antibodies in the experiments that are spectrometryfor samples that are not in the form of fractions. Since there is significant involvement of T lymphocytes for SARS-CoV-2, it is essential to note that more than 1000proteins in the host cells and proteins in the form of I4 HIV-1 were quantified for a cell line indicating HIV by utilizing the SWATH-MS technique [6].

The study highlights the involvement of different molecular medicine approaches such as proteomics, genomics, and identifying biomarkers. The study also puts forward a structure model of biomarkers to predict Covid-19 reoccurrence and acute phase. The purpose of conducting such an analysis is to simplify the diagnosis and prognosis process in patients for COVID-19 [7].

Literature Review

A study conducted by Chen et al. on ninety-nine patients focused on the radiological screening of patients suffering from COVID-19. The disease epicenter in China's country took immediate action towards the radiological screening of individuals that tested positive for COVID-19.C.T.imagingis an essential procedure for patients that are suspected of having the COVID-19 infection. As a result, computed tomography (C.T.) is being used at a significant rate globally. As the outbreak of severe acute respiratory syndrome (SARS) in the previous pandemic spikedin terms of radiographic utilization. The data and information surrounding COVID-19, up till now, have revolved around C.T. scanning for screening patients and further assessments regarding the disease's progression. In their findings, Cheng et al. discovered that bilateral pneumonia was the

most predominant medical symptom observed in the patients' internal functioning diagnosed with COVID-19[8].

A study by (Lomoro et al., 2020) is based on investigatingall the features under patients' imaging. COVID-19 pneumonia in the patients was elaborately screened through chest ultrasound (U.S.) [9]. Examinationsthat are carried out provide comprehensive radiological literature review in terms of the current radiological data.In their study, fifty-eight patients were selected for the examination at the level of admission. It is noteworthy that all fifty-eight patients had a high fever.Typical CT features included bilateral and multilobar ground-glass opacities (GGO) with (59.5%) and without (35.7%) consolidations having a predominantly peripheral distribution (64.3%). Other imaging features included crazy paving pattern (57.1%), fibrous stripes (50%), subpleural lines (35.7%), architectural distortion (28.6%), air bronchogram sign (26.2%), vascular thickening (23.8%) and nodules (2.4%). Also, enlarged lymph nodes (14.3 %) and pleural effusion (7.1%) were observed. The literature review identified twenty-six original studies supporting imaging chest findings.

Moreover, cough symptoms were prevalent among thirty-three out of fifty-eight patients. The results for radiological examinations in their study were recognized as eleven patients from CXR and C.T. from fifteen subjects [10].43 studies involving 3600 patients were included. Among COVID-19 patients, fever (83.3% [95% CI 78.4–87.7]), cough (60.3% [54.2–66.3]), and fatigue (38.0% [29.8–46.5]) were the most common clinical symptoms. The most common laboratory abnormalities were elevated C-reactive protein (68.6% [58.2–78.2]), decreased lymphocyte count (57.4% [44.8–69.5]) and increased lactate dehydrogenase (51.6% [31.4–71.6]). Ground-glass opacities (80.0% [67.3–90.4]) and bilateral pneumonia (73.2% [63.4–82.1]) were the most frequently reported findings on computed tomography. The overall estimated proportion of severe cases and case-fatality rate (CFR) was 25.6% (17.4–34.9) and 3.6% (1.1–7.2), respectively. CFR and laboratory abnormalities were higher in severe cases, patients from Wuhan, and older patients, but CFR did not differ by gender. These results prove to be significantly helpful towards predicting the COVID-19 virus in terms of diagnosis and prognosis. These scans showed the internal and biological alterations occurring inside the body, giving a clear insight into the severe symptoms expected in the patients during a viral infection. **Figure 1**

shows a young female's scanwith an undiagnosed lung condition along with a zero-response rate towards therapy—all the other contributing factors such as known comorbidities.

The medical history of the patient showed no sign of lung conditions among the relatives. The X-ray carried out in the patient showed bilateral opacities suspected to be peripheral and significantly evident for the left lung.The CT scan of the axial region displays ground-glass opacities towards the upper lobe at the right side of the lungs and solid opacity towards the left side.The more transparent findings were observed in the upper lobes as compared to the lower lobes. The lower lobe towards the left region shows the appearance of intense consolidation. In the C.T. scan, the bronchogramis observable as well. Diagnosis of COVID-19 in terms of atypical screening was confirmed by using an oropharyngeal swab.

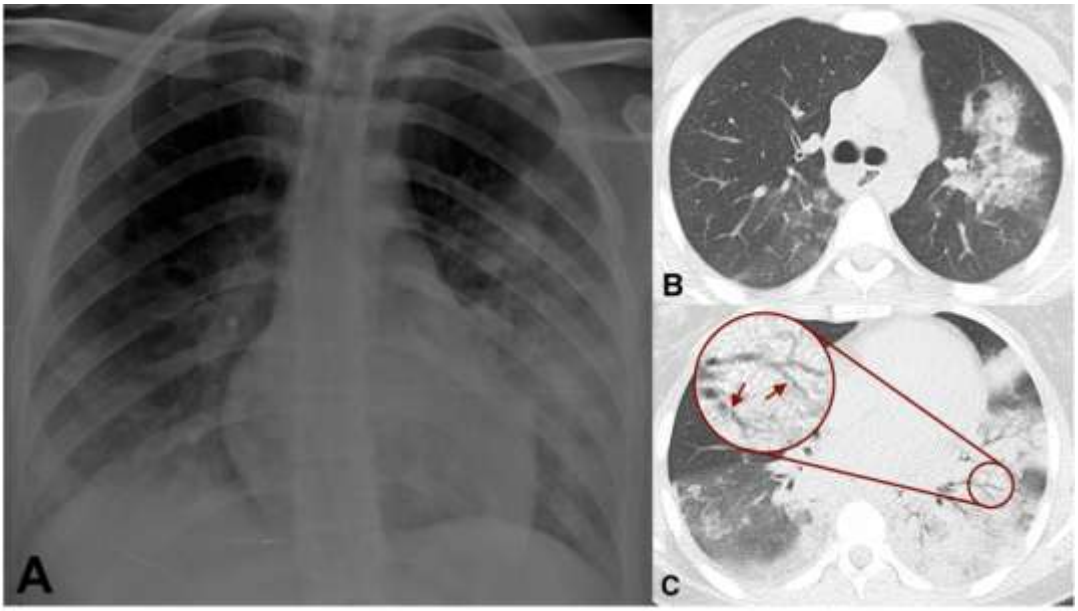

Figure 1. Scan of Lungs showing a condition after seven days of cough (Lomoro et al., 2020) [12]

Research by (Shu et al., 2020) recorded the condition of patients with COVID-19 through plasma proteomics. The study involved all sorts of patients with multiple kinds of symptoms.Additionally, pointing out useful biomarkers for COVID-19. Their research also put forward the alterations in the plasma proteins of COVID-19 patients in terms of pathogenesis.The plasma levels among the participants were observed to be

elevatedfortheextreme conditions of COVID-19. Moreover, based on the research outcomes, it can be standardizedthat theproteins altered significantly and could be therapeutic for COVID19. For example, some clinically approved anticoagulants, such as proteinase-activated receptor-1 (PAR-1) antagonists, antithrombin, and antifactorXa, might ameliorate COVID-19 severity associated with intravascular coagulation and inflammation.

Methodology

The selected methodology of the results is a qualitative analysis of the present literature on the topic revolving around the prevalence of molecular medicine during COVID-19 pandemic. The radiological screening and molecular evaluation of the biological symptoms after getting infected by COVID-19. The study also structured a detailed timeline for the COVID-19 virus's biomarkers from the pre-disease stage to the chronic phase.

The inclusion criteria for the study's literature review involve research that gives accurate and relevant data in terms of radiological screening, proteomics, genomics, and other molecular medicine aspects. Moreover, the study focused mostly on the qualitative analysis of the clinical investigations included in the literature review.

The study's model illustrating the severity of the virus in all stages of the virus is designed based on the biomarkers from the SARS-COV-2 virus. The indicators and timelines from the previous pandemic help predict the diagnosis and prognosis for the COVID-19 virus. The stages included in the timeline are; 1) Pre-disease, 2) Acute Phase, 3) Convalescent phase and the 4) Chronic phase [11][12][13][14]. The pre-disease refers to the period in which the symptoms might or might not be prevalent right after contracting the virus. The acute phase is the peak at which the severity of the virus is most intense, whereas the convalescent phase is where the patient enters the recovery stage and the Chronic phase is where the white blood cells inside the body are still low due to the action against antibodies.

Results

The study structured a model **Fig 2.** based on the severity of the virus along with its different phases following the time span of the virus. The X axis demonstrates the tie span in terms of

weeks, and months. Since the onset of the virus is still at a stage of infancy, the specified time period of each stage is uncertain. At the Y axis, the graph shows the severity of the virus. The curve is observably fluctuating at every stage with the most height at the acute phase. The curve is seen to straighten after the acute phase where the virus reaches the convalescent and chronic phases.

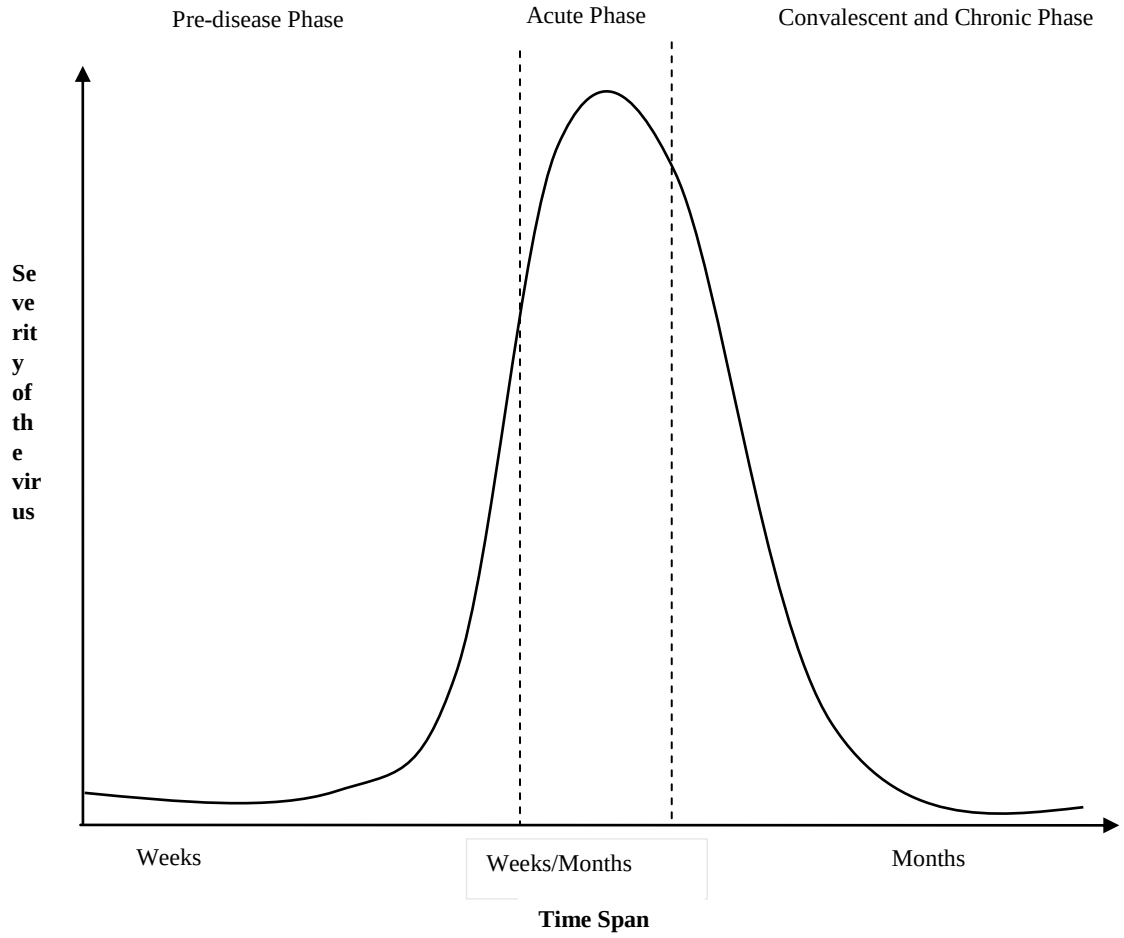

Figure 2. Curve of Severity at every stage of the COVID-19 virus

Discussion

The study is focused on the different parameters under which the field of molecular medicine has contributed to regulating the treatment of COVID-19. The curve presented in the research shows

a fluctuation in the extremity and intensity of the virus. One of the prime characteristics of the COVID-19 virus is that the virus's symptoms might or might not be prevalent in the individuals after contracting the virus. The articles accumulated for the literature review are focused on clinical investigations that use proteomics and imaging of all the features screened and analyzed through the field.

The clinical investigation performed by (Shu et al., 2020) put forward an extensive study with proteomics of the plasma cohort of both affected and unaffected individuals. Their study aimed to generate biomarkers for the COVID-19 virus for better management of the virus. Their research also revealed that the plasma levels in the more extreme cases were elevated. Moreover, the review also included a prolonged study based around ninety-nine patients. Their study presented multiple findings, including the most predominant one being the prevalent bilateral pneumonia in the patients.

Figure 2 is a structured curve that illustrates the status of the virus in terms of the extremity and severity of the patients' health after contracting the virus. The virus's pre-disease phase covers the period where the host has just contracted the virus. This is usually the stage where the symptoms might or might not show, depending on the individual. In some cases, the individuals might be asymptomatic and tend to carry the virus without any prominent or intense symptoms.

Conclusion

The study revolves around molecular medicine as a contributor to the management and treatment of the COVID-19 virus. The area of molecular medicine deals with the molecule-based study of the cellular functions inside the human body. Such a function is important for studying the functioning of the COVID-19 virus. Although there is less data at the time being for the clinical and radiological outcomes of the covid-19 virus, there are still significant clinical records collected since the outbreak of the virus. Moreover, the fluctuations in the virus's symptoms have been illustrated with the help of a curve with Time period on X-axis and severity of the virus on Y axis.

References

1. Uddin, M., Mustafa, F., Rizvi, T.A., Loney, T., Suwaidi, H.A., Al-Marzouqi, A.H.H., Eldin, A.K., Alsabeeha, N., Adrian, T.E., Stefanini, C. and Nowotny, N., 2020. SARS-CoV-

2/COVID-19: Viral genomics, epidemiology, vaccines, and therapeutic interventions. *Viruses*, *12*(5), p.526.

2. Messner, C.B., Demichev, V., Wendisch, D., Michalick, L., White, M., Freiwald, A., Textoris-Taube, K., Vernardis, S.I., Egger, A.S., Kreidl, M. and Ludwig, D., 2020. Ultra-high-throughput clinical proteomics reveals classifiers of COVID-19 infection. *Cell systems*, *11*(1), pp.11-24.
3. Rhoads, D.D., Cherian, S.S., Roman, K., Stempak, L.M., Schmotzer, C.L. and Sadri, N., 2020. Comparison of Abbott ID Now, DiasorinSimplexa, and CDC FDA EUA methods for the detection of SARS-CoV-2 from nasopharyngeal and nasal swabs from individuals diagnosed with COVID-19. *Journal of clinical microbiology*.
4. Hanash, S., 2003. Disease proteomics. *Nature*, *422*(6928), pp.226-232.
5. Hang, H.C., Yu, C., Kato, D.L. and Bertozzi, C.R., 2003. A metabolic labeling approach toward proteomic analysis of mucin-type O-linked glycosylation. *Proceedings of the National Academy of Sciences*, *100*(25), pp.14846-14851.
6. Fu, J., Tang, J., Wang, Y., Cui, X., Yang, Q., Hong, J., Li, X., Li, S., Chen, Y., Xue, W. and Zhu, F., 2018. Discovery of the consistently well-performed analysis chain for SWATH-MS based pharmacoproteomic quantification. *Frontiers in pharmacology*, *9*, p.681.
7. Wynants, L., Van Calster, B., Collins, G.S., Riley, R.D., Heinze, G., Schuit, E., Bonten, M.M., Dahly, D.L., Damen, J.A., Debray, T.P. and de Jong, V.M., 2020. Prediction models for diagnosis and prognosis of covid-19: systematic review and critical appraisal. *bmj*, *369*.
8. Cheng, Y., Luo, R., Wang, K., Zhang, M., Wang, Z., Dong, L., Li, J., Yao, Y., Ge, S. and Xu, G., 2020. Kidney disease is associated with in-hospital death of patients with COVID-19. *Kidney international*.
9. Lomoro, P., Verde, F., Zerboni, F., Simonetti, I., Borghi, C., Fachinetti, C., Natalizi, A. and Martegani, A., 2020. COVID-19 pneumonia manifestations at the admission on chest ultrasound, radiographs, and CT: single-center study and comprehensive radiologic literature review. *European journal of radiology open*, p.100231.
10. Fu, L., Wang, B., Yuan, T., Chen, X., Ao, Y., Fitzpatrick, T., Li, P., Zhou, Y., Lin, Y., Duan, Q. and Luo, G., 2020. Clinical characteristics of coronavirus disease 2019 (COVID-19) in China: a systematic review and meta-analysis. *Journal of Infection*.

11. Lukasik, M., Rozalski, M., Luzak, B., Michalak, S., Kozubski, W. and Watala, C., 2010. Platelet activation and reactivity in the convalescent phase of ischaemic stroke. *Thrombosis and haemostasis*, *103*(03), pp.644-650.
12. Alexandrova, M.L. and Bochev, P.G., 2005. Oxidative stress during the chronic phase after stroke. *Free Radical Biology and Medicine*, *39*(3), pp.297-316.
13. Rolland, J.S., 2020. COVID- 19 Pandemic: Applying a Multisystemic Lens. *Family process*, *59*(3), pp.922-936.
14. Carfì, A., Bernabei, R. and Landi, F., 2020. Persistent symptoms in patients after acute COVID-19. *Jama*, *324*(6), pp.603-605.
15. Nicol, T., Lefeuvre, C., Serri, O., Pivert, A., Joubaud, F., Dubée, V., Kouatchet, A., Ducancelle, A., Lunel-Fabiani, F. and Le Guillou-Guillemette, H., 2020. Assessment of SARS-CoV-2 serological tests for the diagnosis of COVID-19 through the evaluation of three immunoassays: Two automated immunoassays (Euroimmun and Abbott) and one rapid lateral flow immunoassay (N.G. Biotech). *Journal of Clinical Virology*, *129*, p.104511.
16. Bojkova, D., Klann, K., Koch, B., Widera, M., Krause, D., Ciesek, S., Cinatl, J. and Münch, C., 2020. Proteomics of SARS-CoV-2-infected host cells reveals therapy targets. *Nature*, *583*(7816), pp.469-472.