IIT Indore Scientists Decode How COVID-19 Variants Trigger Long-Term Health Issues

A major study by **IIT Indore**, in collaboration with top Indian institutions, and published in the reputed *Journal of Proteome Research*, has uncovered how different variants of the COVID-19 virus affected the human body and led to varying levels of disease severity. This research was led by Dr. Hem Chandra Jha from IIT Indore and Dr. Nirmal Kumar Mohakud from KIMS Bhubaneswar, with support from the Indian Council of Medical Research (ICMR) and IIT Indore.

The team studied key biochemical, hematological, lipidomic, and metabolomic changes linked with various variants of concern (VOCs) of SARS-CoV-2—specifically the original wild type (WT), Alpha, Beta, Gamma, and Delta variants. Using clinical data from 3,134 COVID-19 patients from the first and second waves in India, researchers applied machine learning to identify nine critical parameters related to disease severity: C-reactive protein (CRP), D-dimer, ferritin, neutrophils, white blood cell (WBC) count, lymphocytes, urea, creatine, and lactate dehydrogenase (LDH).

In addition to analyzing patient data, the researchers studied lung and colon cells that were exposed to different spike proteins from these virus variants. Among all, the Delta variant showed the most significant disruptions in the body's chemical balance. It affected pathways related to catecholamine and thyroid hormone production. These findings were further supported by a meta-analysis that pointed to disruptions in urea and amino acid metabolism.

This combined analysis of patient data and lab experiments gives important insights into how COVID-19 affects the body at a molecular level. The study also involved advanced technologies like multi-omics and Raman spectroscopy used by Prof. Rajesh Kumar’s team at IIT Indore to map these disruptions. Patient data analysis was guided by Prof. Sonali Agarwal from IIIT Allahabad.

Authors who contributed to this study include Budhadev Baral, Vaishali Saini, Siddharth Singh, Tarun Prakash Verma, Deb Kumar Rath, Jyotirmayee Bahinipati, Priyadarsini Panda, Shubhransu Patro, Namrata Misra, Manas Ranjan Behera, Kartik Muduli, Hamendra Singh Parmar, Ajay Kumar Meena, and Soumya R. Mohapatra.

Prof. Suhas S. Joshi, Director of IIT Indore, remarked, “This study is a testament to the strength of interdisciplinary collaboration and cutting-edge research at IIT Indore. Understanding the long-term impact of COVID-19 at a molecular level is vital for preparing better healthcare responses and designing targeted treatments.”

Dr. Hem Chandra Jha, Associate Professor, IIT Indore added, “Our findings reveal how different COVID-19 variants influence the body in unique ways, particularly the Delta variant, which caused major disruptions in metabolic and hormonal pathways. This research could help develop precise diagnostics and therapies to manage long COVID symptoms more effectively.”

This research is expected to help improve our understanding of how COVID-19 causes complications and could pave the way for better diagnosis and treatment strategies in the future.