With Long COVID Study Uncovers Distinct Blood Protein Signature in Children

A recent study published investigated the unique inflammatory and angiogenetic protein markers in children suffering from long coronavirus disease (Long COVID).

A team of researchers from Italy and the United States analyzed blood plasma proteomics to distinguish these markers from those in healthy children, pediatric cases of acute coronavirus disease 2019 (COVID-19), and Multisystem Inflammatory Syndrome in Children (MIS-C) patients.

Study

The present study analyzed blood plasma proteins in children aged between 2 and 18 years from Rome, Italy, to identify unique inflammatory markers in Long COVID cases compared to healthy controls, MIS-C patients, and children with acute COVID-19.

Children exhibiting persistent symptoms for at least eight weeks post-infection that negatively impact daily life were diagnosed with Long COVID. The researchers evaluated the cases using strict clinical and World Health Organization (WHO) guidelines to exclude alternative diagnoses.

The study conducted the proteomic analysis using the Olink Inflammation 96-plex panel, designed to detect inflammation-related proteins with high specificity. The plasma protein data was normalized, and statistical adjustments were made to reduce variability and facilitate cross-group comparisons.

The researchers enrolled a total of 112 children, categorized into four groups — 34 in the Long COVID group, 32 in the acute COVID-19, 27 in the MIS-C group, and 19 healthy controls. Statistical methods were used to evaluate protein concentrations, and they were adjusted for multiple comparisons to identify significant differences.

The study used Principal Component Analysis (PCA) to visualize protein expression patterns and highlight distinct profiles for Long COVID compared to other groups.

Machine learning methods were also applied to proteomic data to optimize feature selection and model performance. The models were trained on 60% of the dataset and validated on the remaining 40%.

The association of proteins related to inflammation and angiogenesis, such as C-X-C motif chemokine ligand 8 (CXCL8), CXCL11, and Oncostatin M (OSM), with Long COVID cases was comprehensively examined.

Long COVID in Children

The study found that children with Long COVID exhibit a distinct blood protein signature characterized by persistent inflammation and angiogenesis.

The proteomic analysis revealed significant overexpression of pro-inflammatory markers, including CXCL8, CXCL11, and OSM, in Long COVID cases compared to healthy controls, the MIS-C group, and acute COVID-19 cases.

The researchers noted that these proteins are involved in neutrophil activity, T-cell chemotaxis, and cytokine regulation, suggesting ongoing immune activation during Long COVID.

The findings also highlighted elevated angiogenetic factors such as vascular endothelial growth factor A (VEGF-A) and tumor necrosis factor superfamily member 12 (TNFSF12) in Long COVID patients, indicating vascular inflammation.

Furthermore, the proteomic patterns showed clear segregation of Long COVID cases from other groups driven by these distinct protein markers in the PCA analysis. Additionally, children with Long COVID and chronic fatigue displayed elevated fibroblast growth factor 21 (FGF21) levels, a marker associated with metabolic regulation and stress responses. This also aligned with previous findings from adult Long COVID studies.

The machine learning models based on proteomic profiles also accurately classified Long COVID cases with an accuracy of 93%, sensitivity of 97%, and specificity of 86%. The researchers believe that this high diagnostic performance highlighted the potential of proteomic biomarkers for identifying Long COVID in pediatric patients.

The analysis also revealed that while several inflammatory markers overlap between Long COVID and MIS-C, the former presents unique protein signatures distinct from acute COVID-19 and healthy controls.

These results stressed the immune-mediated nature of Long COVID and its similarity with adult Long COVID cases. They also emphasized the importance of inflammation and angiogenesis in its pathophysiology, suggesting potential avenues for therapeutic intervention.

Conclusion

To summarize, the study identified distinct pro-inflammatory and pro-angiogenetic protein markers in children with Long COVID, distinguishing them from controls. These findings demonstrated that Long COVID in children involves persistent immune activation, similar to adult cases.

Moreover, the identified protein signatures provided valuable insights for diagnostics and potential therapies. The researchers stated that future studies should focus on validating these markers and exploring targeted treatments to improve outcomes for affected pediatric patients.

Source:

https://www.news-medical.net/news/20250128/Study-uncovers-distinct-blood-protein-signature-in-children-with-Long-COVID.aspx