Amino acid and acylcarnitine levels relate with chronic schizophrenia

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Introduction

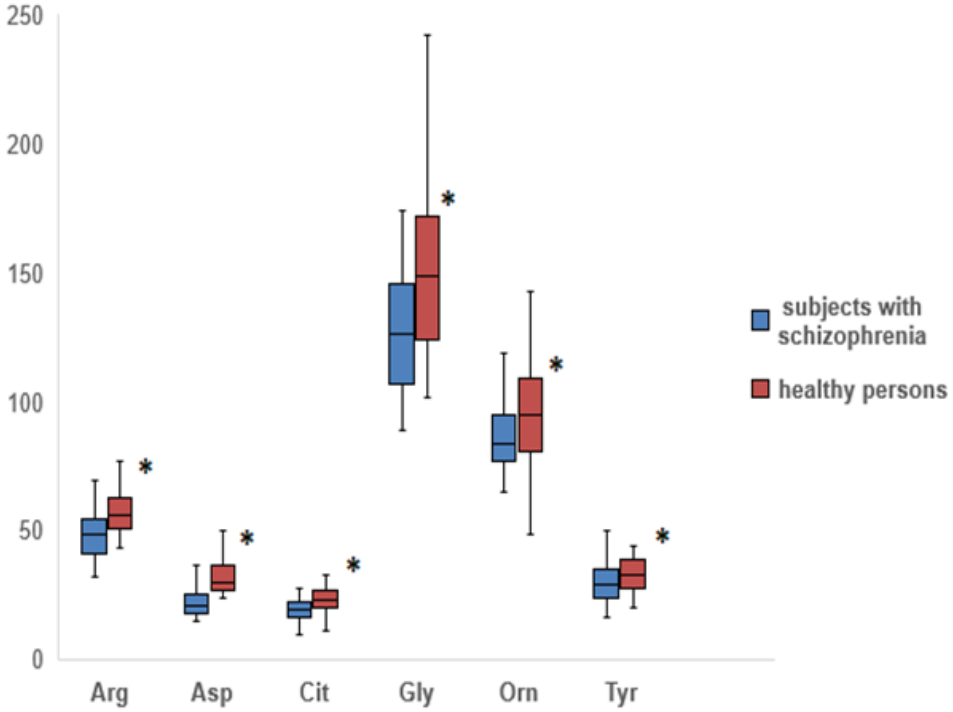
- Schizophrenia is a disease with unknown etiology and pathogenesis. To understand the pathogenesis of schizophrenia, abundant factors and mechanisms were discussed e.g. mitochondrial dysfunction, inflammation, lipid oxidation, DNA damage, oxidative stress and apoptosis. These abnormalities of the metabolic pathways in patients with schizophrenia may well be reflected in metabolomic profiles. Amino acids and acylcarnitines play important role as substrates and intermediate products in the most pathways mentioned above.
- The present study **aim** to investigate serum amino acid and acylcarnitine levels in schizophrenic patients compare with healthy donors using ‘omics’ technology.

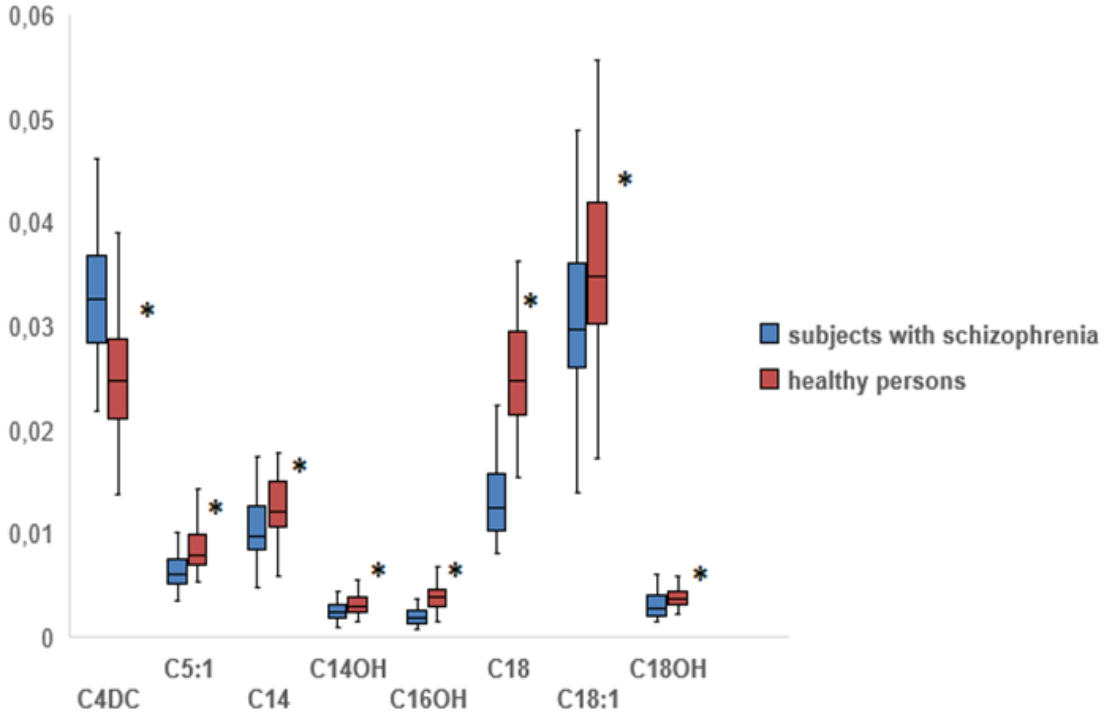
Methods

- The study included 37 persons with schizophrenia (F20 according to ICD-10, median age 35 [31; 39] years, 18 women, mean duration of disease 15 ± 8,5). Healthy controls (n = 36) included an age- and sex-matched cohort without known disease symptoms. Quantification of amino acids and acylcarnitines was carried out using isotope labeled standards from an Amino Acids and Acylcarnitines kit #55000 for newborn screening (Chromsystems Instruments & Chemicals, Germany). Serum from patients and healthy donors was spotted on ProteinSaver cards 903 ™ (Whatman, USA) and samples were prepared according to the kit manufacturer's protocol. The mass spectrometric analysis was carried out in the dynamic multiple reaction monitoring (Dynamic MRM) mode using an Agilent 6410 QQQ mass spectrometer (Agilent Technologies, USA). Peak alignment, integration, and quantification were performed using MassHunter Quantitative Analysis software. Further data processing, analysis and visualization were carried out in the scripting language R v. 3.6.1 with RStudio environment v. 1.2.5001 using the packages "dplyr", "caret", "factoextra", "gglplot2" and others.

Results

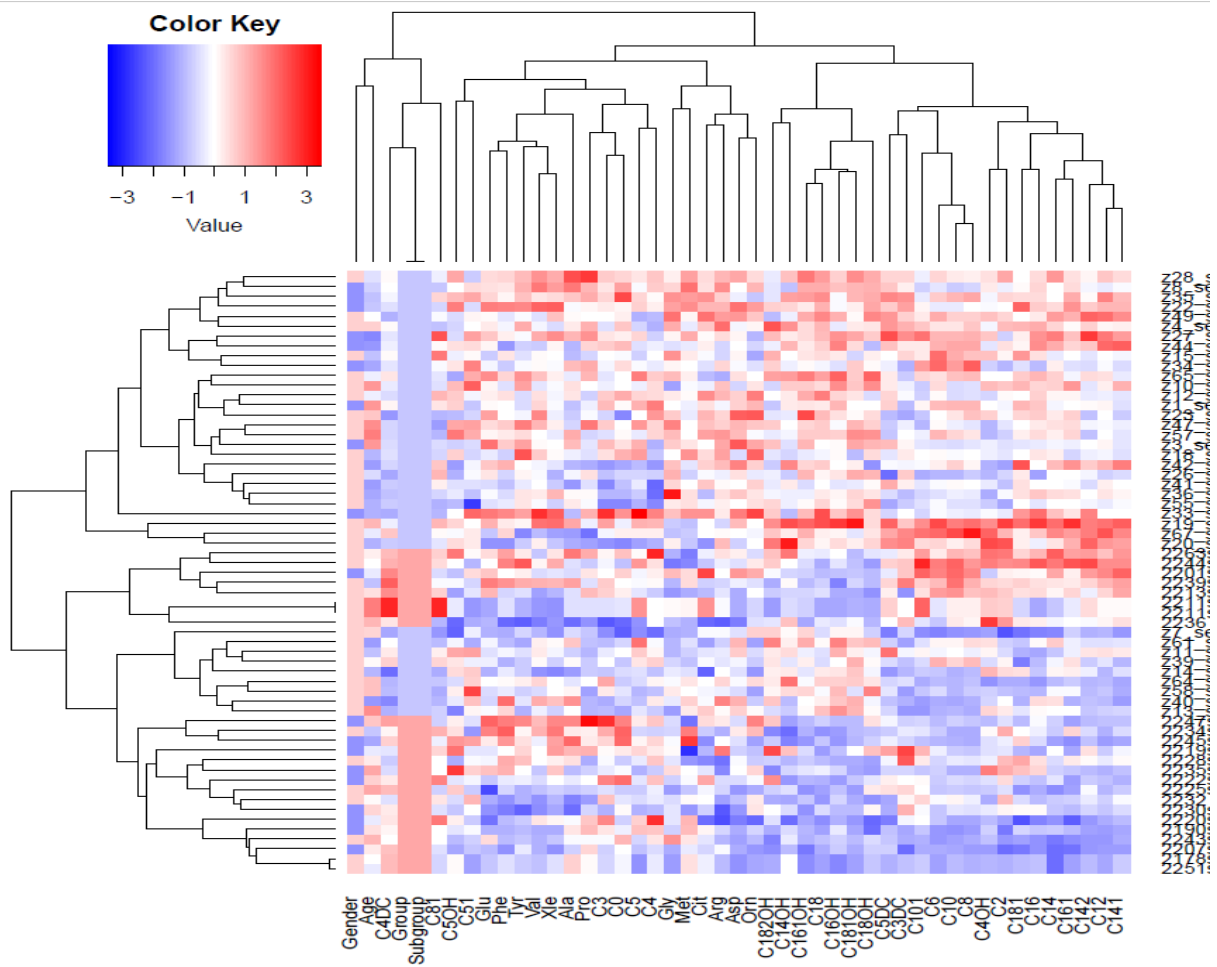
- We found a significant decrease in the concentration of valine, aspartate, citrulline, glycine, arginine, glutamate and ornithine as well as C14, C14OH, C16OH, C16:1, C16:1OH, C18, C18OH, C18:1, C18:1OH, C18:2OH and C5:1 and increase C4DC in patients with schizophrenia in comparison to the controls.





Results

- According to cluster analysis, among acylcarnitines of long chain fatty acids, a group of metabolites was isolated: C18, C18OH, C18:1OH, C18:2OH carnitines (stearic FA derivatives), C16OH, C16:1OH carnitines (palmitic FA derivatives), C14OH carnitine (derivative myristic FA), whose concentrations were reduced in the group of patient compared with the control group. At the same time, C4DC showed an inverse relationship - in the group of patients with schizophrenia, it's concentration was higher.



Conclusions

- According to the literature data these disturbances in the level of amino acids and acylcarnitines are suggested have an impact in pathogenesis both schizophrenia and metabolic imbalance.

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