

# Integrated Plasma Metabolomics Reveals Early Metabolic Signatures And Biomarker Pathways Associated With Alzheimer's Disease Detection

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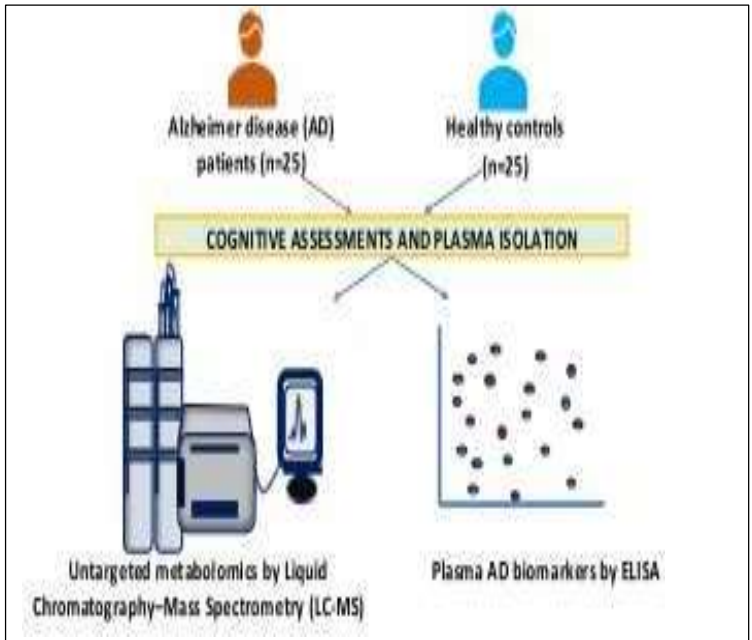
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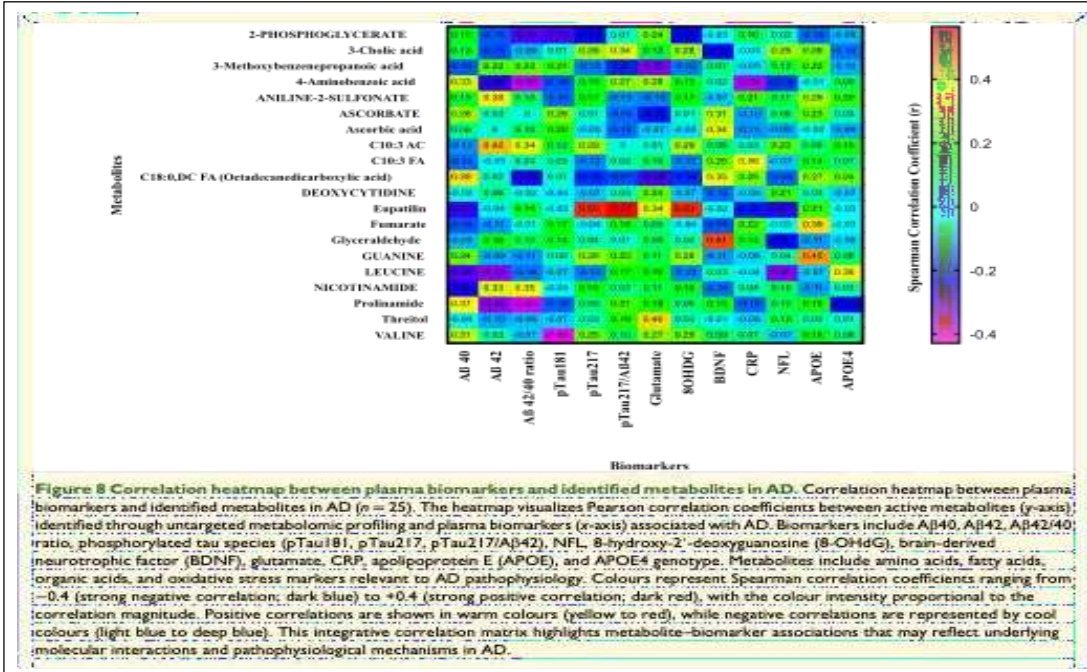
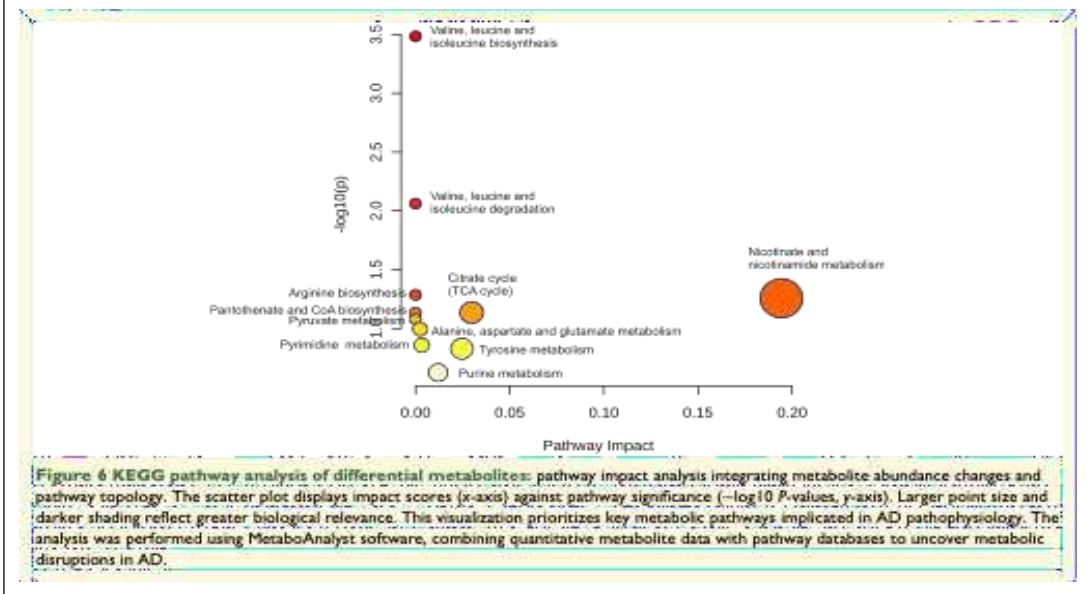
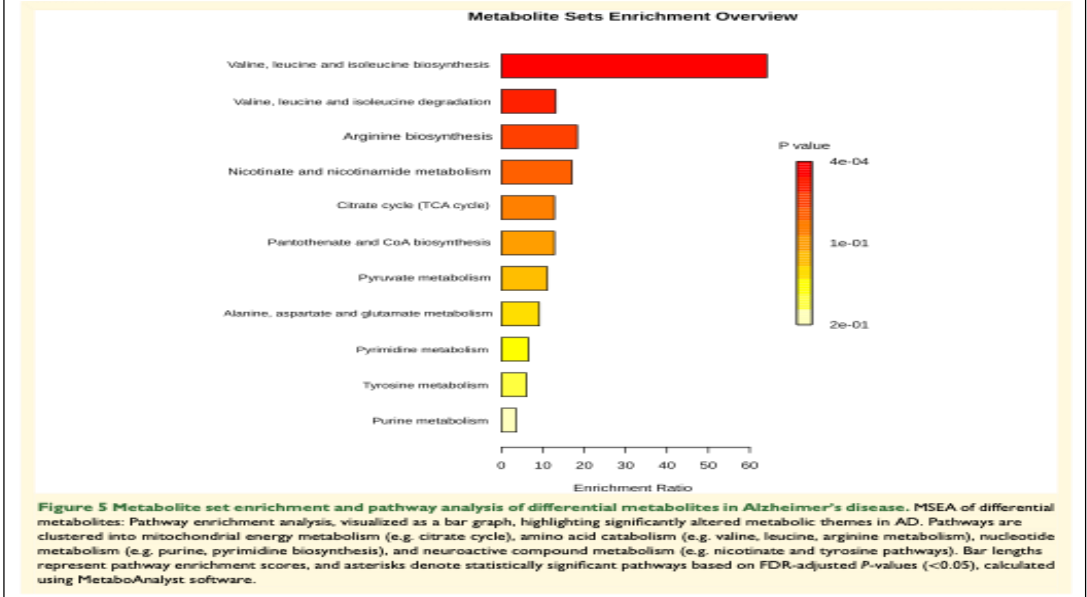
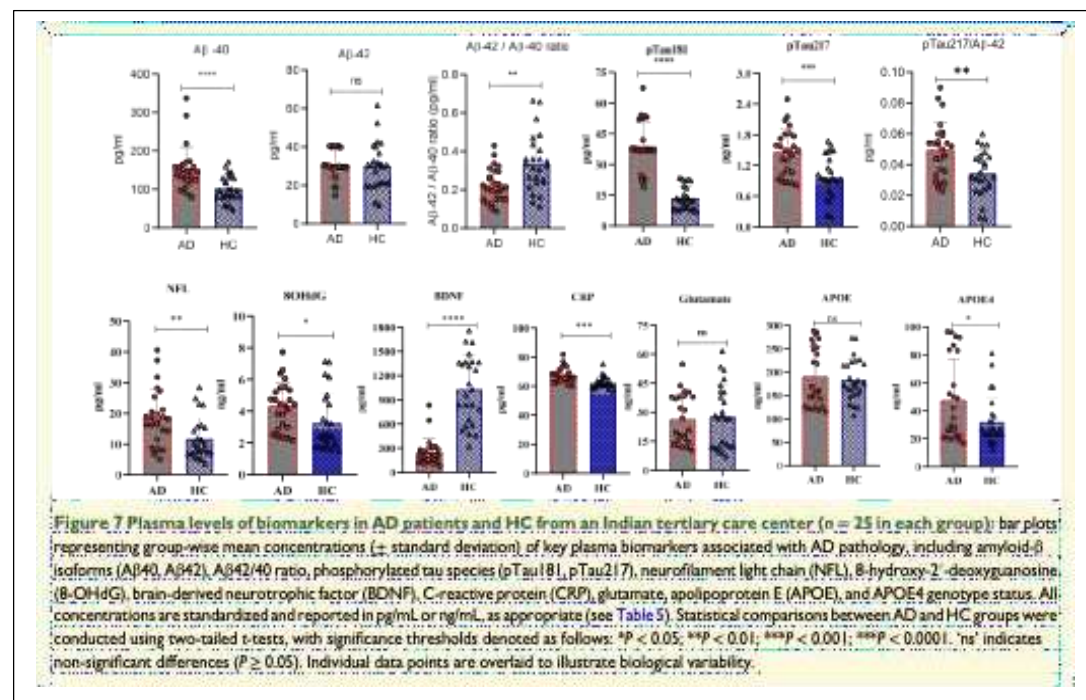
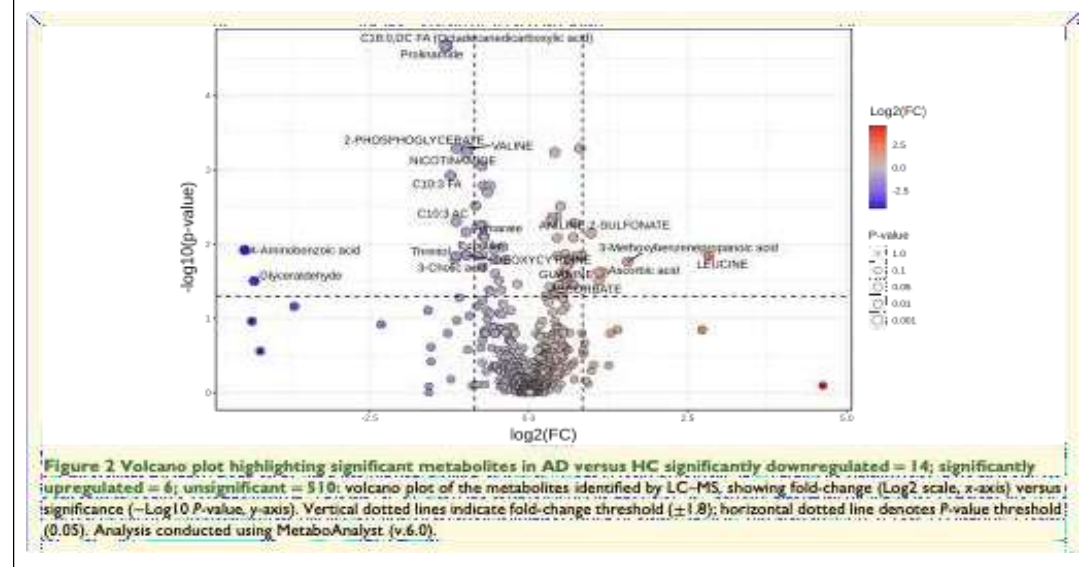
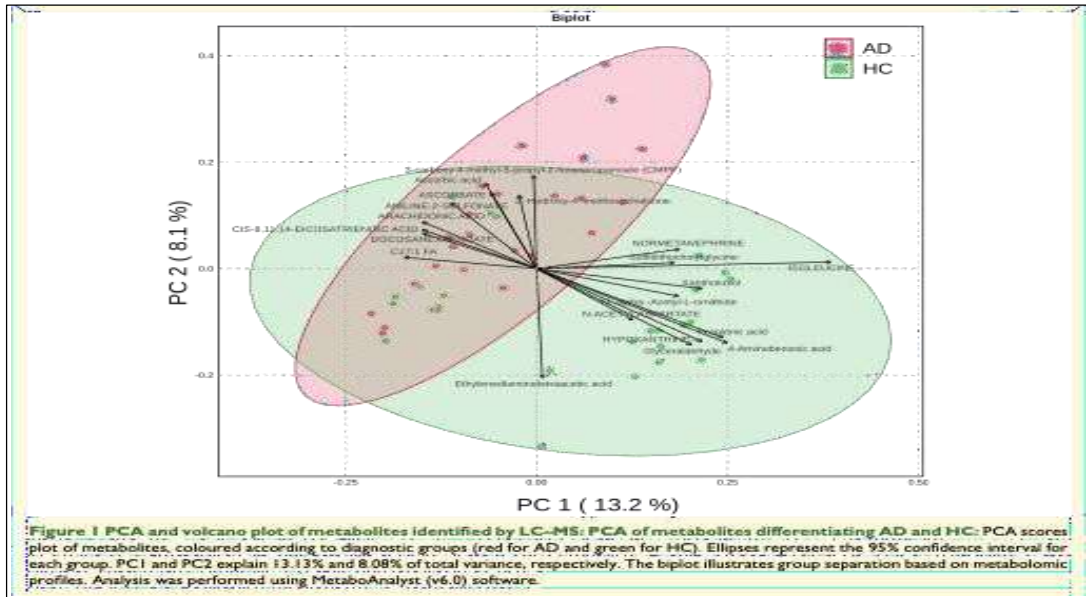
**INTRODUCTION:** Alzheimer's disease (AD) is a multifactorial neurodegenerative disorder marked by cognitive decline, synaptic dysfunction, and metabolic imbalance. While metabolomic and plasma biomarker studies have advanced understanding in Western populations, such data are limited for Indian cohorts.

**OBJECTIVE:** This study integrated plasma metabolomic and biomarker analyses to identify early diagnostic signatures and disrupted pathways in Indian AD patients.

## METHODS:



## RESULTS:



### OUTCOMES

#### COGNITIVE FUNCTION

**AD patients:**

- Total Addenbrooke's Cognitive Examination III ↓
- Clinical Dementia Rating - Global Score and Patient Health Questionnaire-9 scores ↓

**Healthy controls (HCs):**

- Normal cognitive function

#### METABOLITES REGULATION

- Leucine, Ascorbic acid, Ascorbate and 3- Methoxybenzenepropanoic acid and Aniline-2 Sulfonate ↑
- Valine, Nicotinamide, Prolinamide, and Octadecanedicarboxylic acid (C18:0 DCA) ↓
- Eupatillin positively correlated with Phosphorylated Tau217, Phosphorylated Tau217/Amyloid beta-42 ratio, and 8-Hydroxy-2'-deoxyguanosine
- Glyceraldehyde positively correlated with Brain-derived neurotrophic factor
- Guanine positively correlated with Apolipoprotein E4

#### PLASMA BIOMARKERS ALTERATION

- Amyloid beta-40, Amyloid beta -42/Amyloid beta -40 ratio, Phosphorylated Tau181, Phosphorylated Tau217, Phosphorylated Tau217/Amyloid beta-42 ratio, Neurofilament light chain, Apolipoprotein E4, C-reactive protein, and 8-Hydroxy-2'-deoxyguanosine ↑
- Brain-derived neurotrophic factor ↓

## CONCLUSIONS:

This study reveals distinct metabolic and biomarker signatures in Indian AD patients, emphasizing roles of oxidative stress, neuroinflammation, and neurotransmission in disease pathogenesis. The identified molecules may serve as population-specific early diagnostic and therapeutic targets.

## REFERENCES:

1. Polis B, Samson AO. Role of metabolomics in Alzheimer's disease and other metabolic disorders. *Neural Regeneration Research*. 2020;15(8):1460–1470.
2. Rivière S, Birlalez-Aragon N, Nourhashemi F, Vellas B, Lorrain S. Vitamin C in Alzheimer patients: cognitive and oxidative stress relationship. *International Journal of Geriatric Psychiatry*. 1998;13(11):749–754.

AD patients (n=25; mean age: 61.2 ± 7.8 years) and healthy controls (n=25; mean age: 60.6 ± 7.5 years) underwent cognitive and neuropsychiatric assessments.

Plasma metabolomics (LC-MS) and ELISA-based biomarker assays quantified Aβ40, Aβ42, pTau181, pTau217, NFL, APOE4, 8-OHdG, CRP, BDNF, and glutamate.

## ACKNOWLEDGMENT:

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