Abnormal Temporal Slowing on EEG Findings in Preclinical Alzheimer's Disease Patients With the ApoE4 Allele: A Pilot Study

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Introduction: Currently, there are limited accessible and cost-effective biomarkers for preclinical Alzheimer's disease (AD) patients. However, the apolipoprotein E (ApoE) polymorphic alleles can predict if someone is at high (e4), neutral (e3), or low (e2) genetic risk for developing AD. This study analyzed electroencephalogram (EEG) reports from individuals with various ApoE genotypes, aiming to identify EEG changes and patterns that could potentially serve as predictive markers for preclinical AD progression.

Methods: Participants aged 64-78 were selected from the patient database at an outpatient neurology clinic. Genotype studies were performed to determine ApoE status, followed by EEG analysis to identify any apparent trends. A case-control design was used, categorizing participants into cases (e2e3, e2e4, e3e4, e4e4) and controls (e3e3). EEG recordings were compared between the groups to identify potential differences in EEG characteristics, including abnormal temporal slowing, frequency, and ApoE genotype association.

Results: Among 43 participants, 49% demonstrated evidence of abnormal temporal slowing on EEG. Of these, 48% displayed focal left temporal slowing, and 52% displayed bilateral temporal slowing. The right-sided temporal slowing was not observed. Among participants with abnormal slowing, 95% exhibited theta frequency (4-8 Hz) slowing, while only 4.8% displayed delta frequency (0-4 Hz) slowing. Among participants with the ApoE4 allele, 61.5% demonstrated evidence of abnormal slowing, compared to 43.3% without it. Furthermore, the presence of an ApoE4 allele was associated with a significantly higher proportion of males (54%) compared to those without it (13%) ($p=0.009$).

Conclusions: Although we did not find a statistically significant difference in temporal EEG slowing among different ApoE genotypes, our findings suggest a potential association between temporal slowing on EEG and the presence of an ApoE4 allele in individuals with preclinical AD. These observations highlight the need for further exploration into the potential influence of the ApoE4 allele on EEG findings and the utility of EEG as a complementary diagnostic tool for AD. Longitudinal studies with large sample sizes are needed to establish the precise relationship between EEG patterns, ApoE genotypes, and AD progression.