

INVESTIGATION OF INDEPENDENT RISK FACTORS FOR HYDROCEPHALUS IN ALZHEIMER'S DISEASE PATIENTS

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Background

- We investigate the risk factors for hydrocephalus in patients with Alzheimer's disease (AD) with a specific focus on identifying clinical, genetic, and demographic predictors that may inform personalized risk stratification and management.

Methods

- This study enrolled 329 AD patients admitted to West China Hospital of Sichuan University between January 2023 and January 2025, who were diagnosed by amyloid PET/CT or CSF pathological biomarkers.
- AD patients were stratified by the Evans index (cutoff value: 0.30) into the AD with hydrocephalus group (AD-H, n=115) and the AD without hydrocephalus group (AD-NH, n=214). Patients' comorbidity profiles were obtained, and the Age-Adjusted Charlson Comorbidity Index (ACCI) scores were computed. Binary Logistic regression was used to analyze independent risk factors for hydrocephalus in AD patients.

Results

- In this study, the incidence of hydrocephalus in AD patients was relatively high (35.00%). Compared with the non-hydrocephalus group, patients in the hydrocephalus group demonstrated lower MoCA scores, higher ACCI scores, and lower APOE-ε4 carrier rates (figure1).

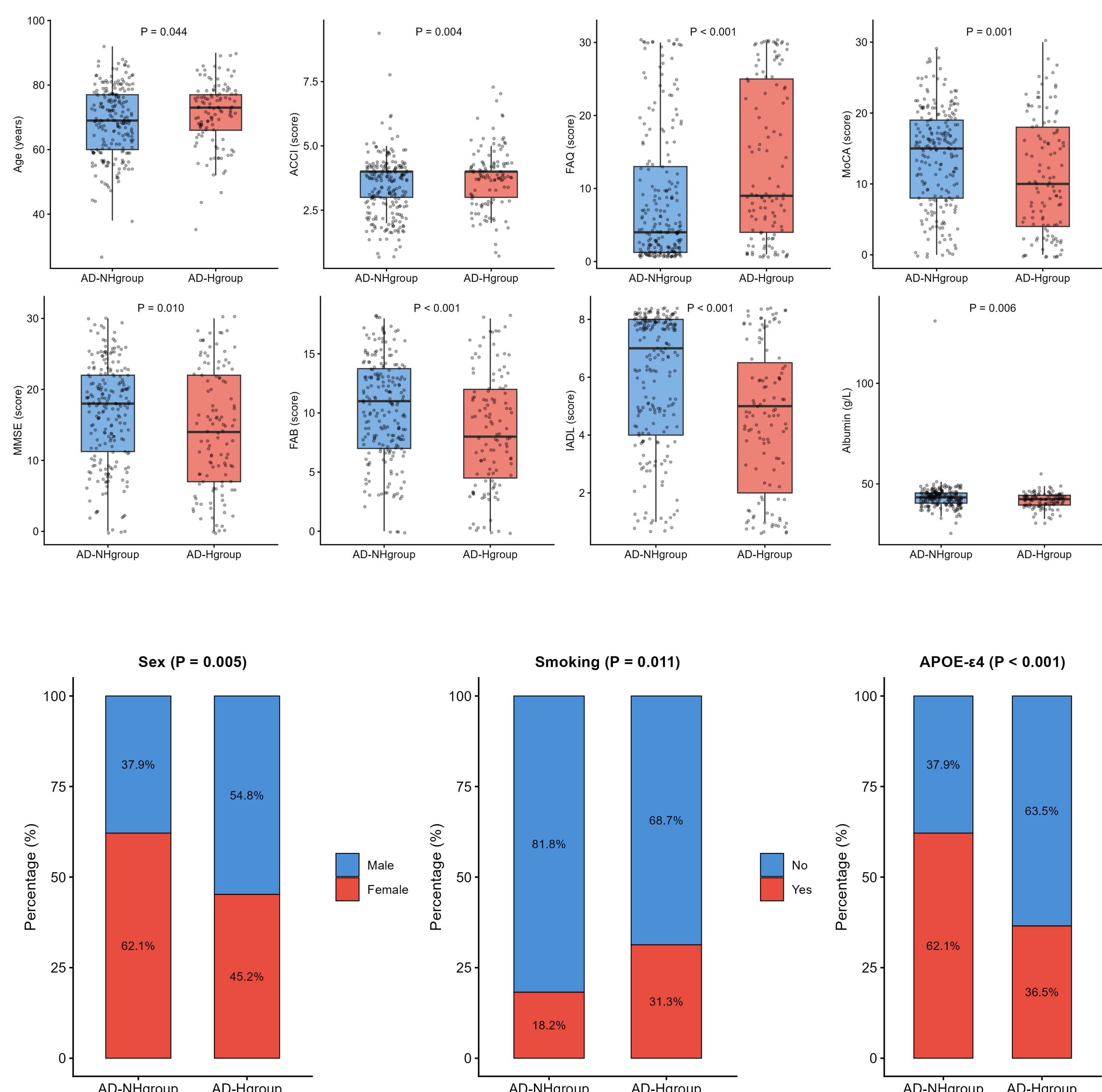


Figure 1. Baseline characteristics of AD patients with and without hydrocephalus

- Correlation analysis revealed significant associations between cognitive function, ACCI scores, APOE-ε4 carrier status, and hydrocephalus, which remained significant after adjusting for gender, educational attainment and disease duration (figure2).
- Given the collinearity among the FAB, MoCA, and IADL scales, three separate multiple linear regression models were constructed. Multivariate binary Logistic regression analysis showed that lower MoCA scores ($\beta=-0.078$, $p<0.001$), lower IADL scores ($\beta=-0.236$, $p<0.001$), lower FAB scores ($\beta=-0.127$, $p<0.001$), higher ACCI scores, and lower APOE-ε4 allele carriage were independent risk factors for hydrocephalus in AD patients (figure3).

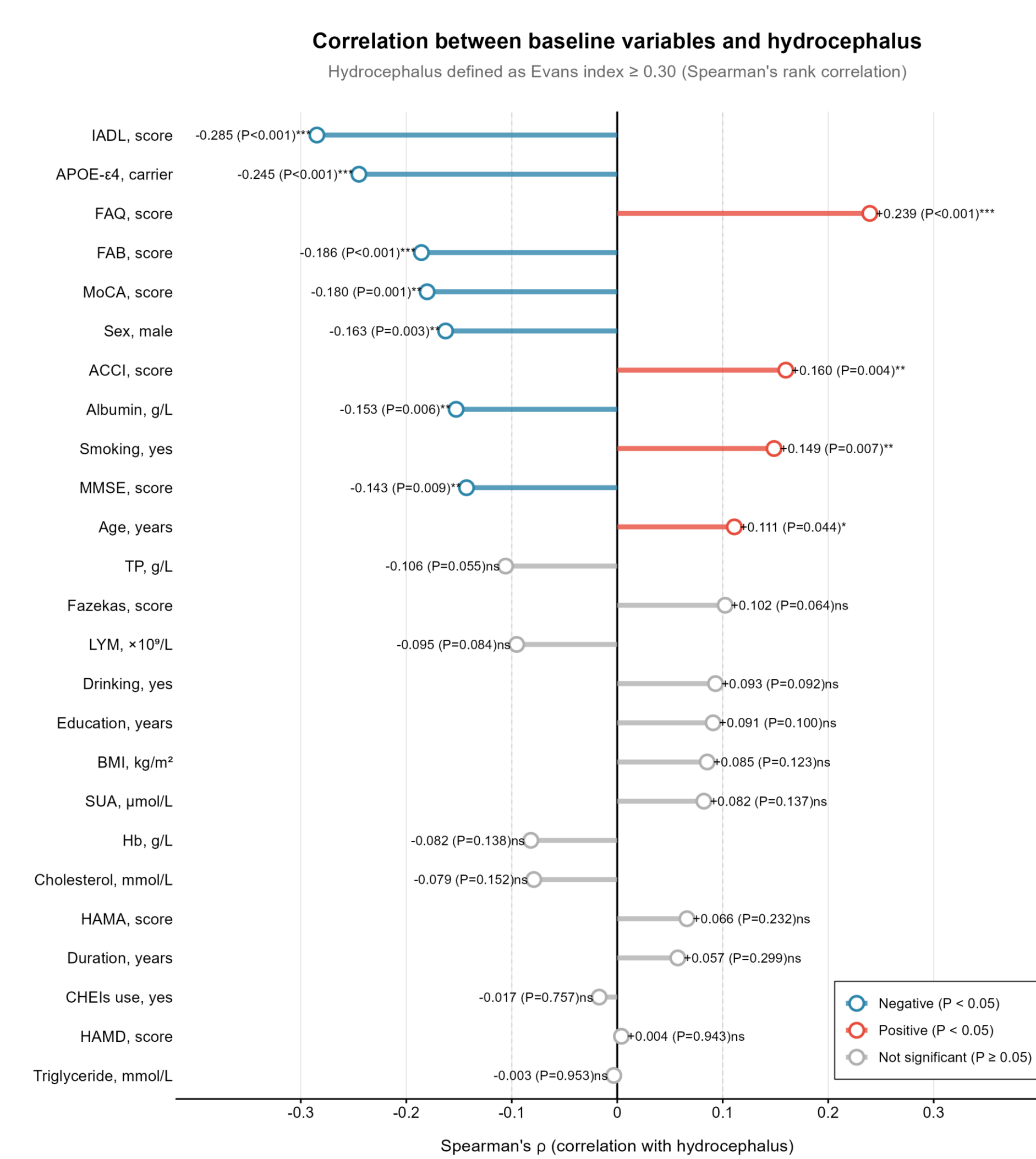


Figure2. Spearman's rank correlation coefficients between baseline variables and hydrocephalus

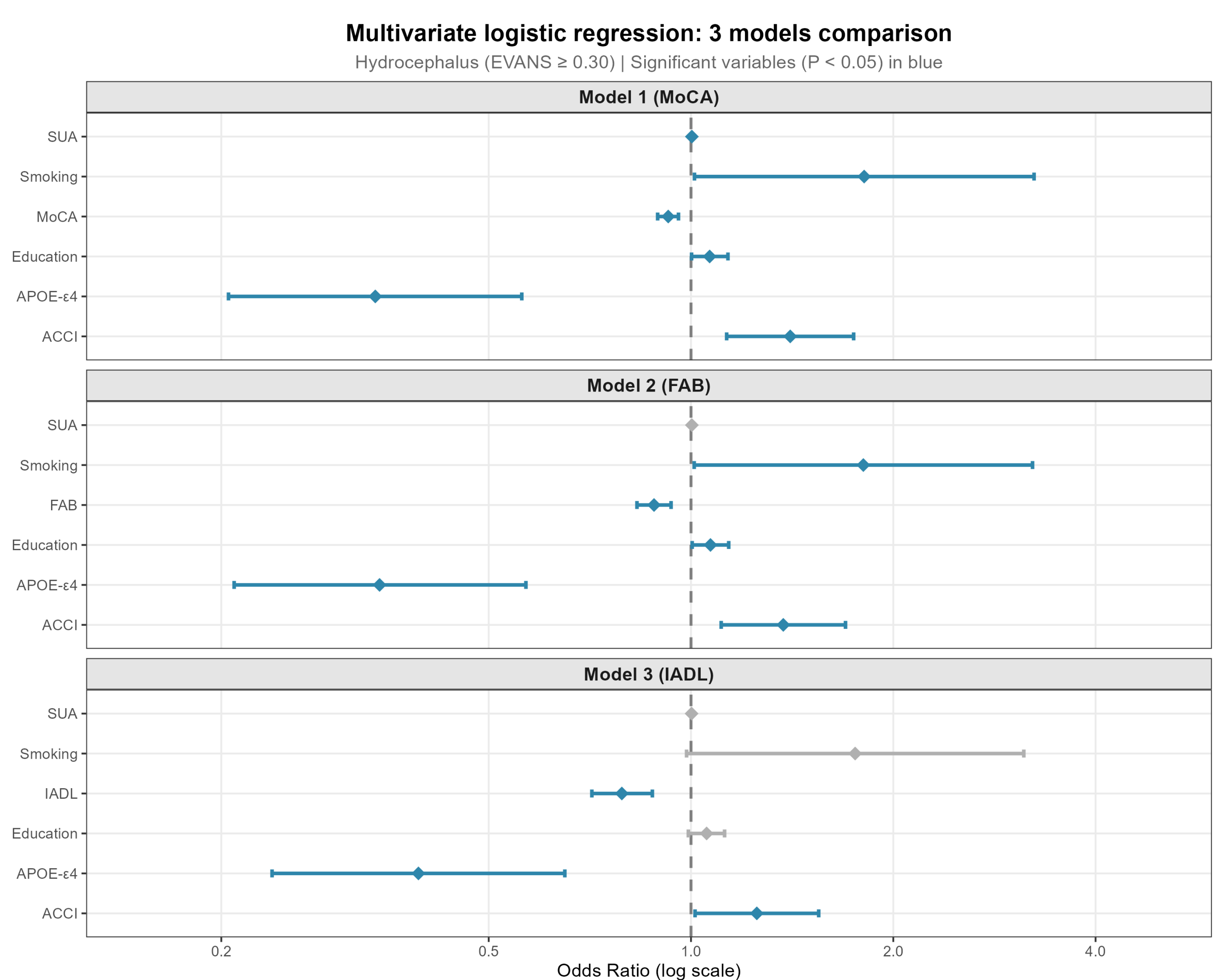


Figure3. Multivariable binary logistic regression models (3 groups) using MoCA, IADL, and FAB as representative cognitive and functional scales

- Exploratory analysis revealed that ACCI score and APOE-ε4 carrier status were two independent influencing factors for the presence of hydrocephalus in patients with AD, with no interaction between them ($p = 0.942$)(figure4).

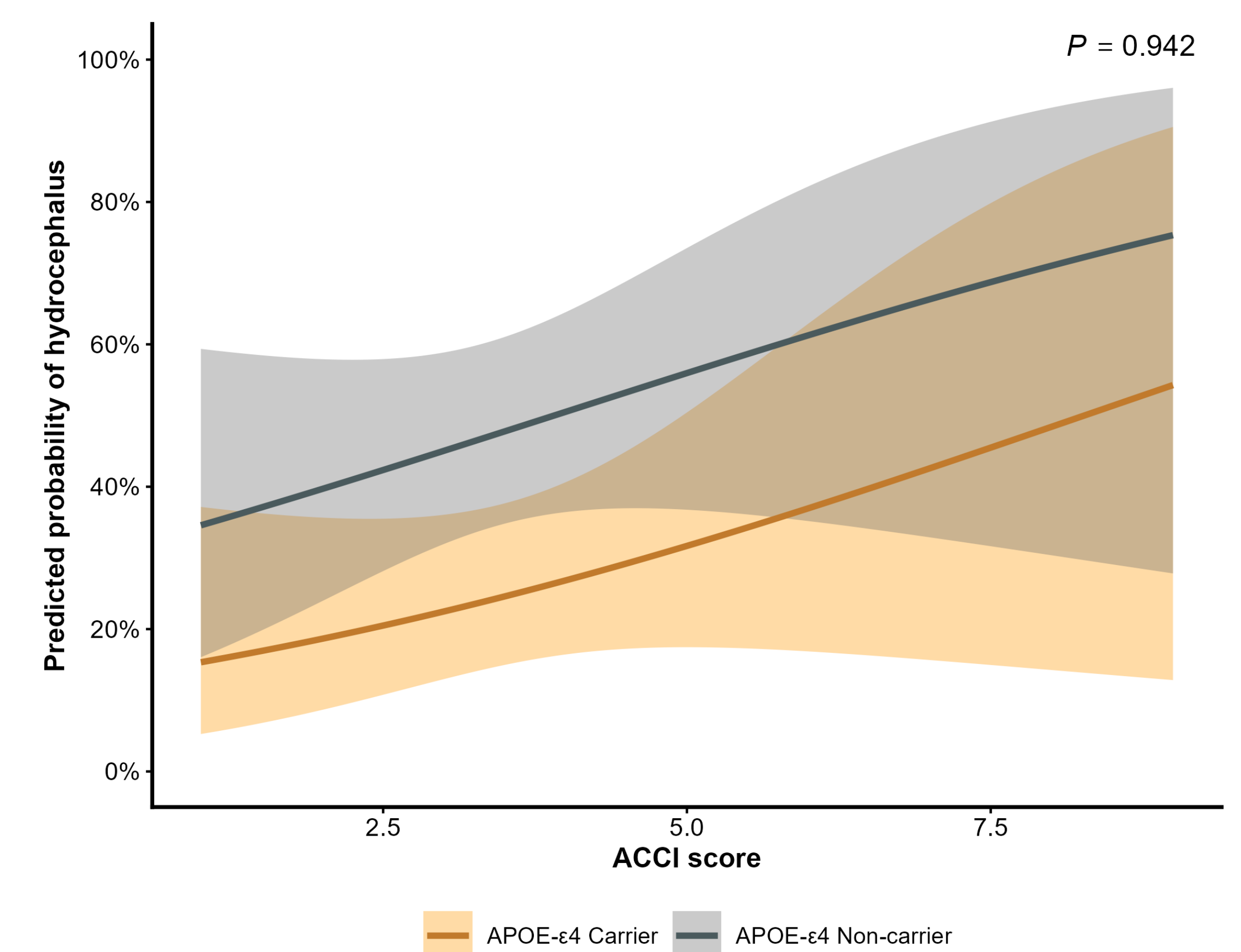


Figure4. Interaction between ACCI and APOE-ε4 on hydrocephalus risk

Conclusions

Hydrocephalus is relatively common in AD patients, with those suffering from severe cognitive impairment, heavy comorbidity burden, or without APOE-ε4 allele carriage being more susceptible. AD patients without the APOE4 allele were paradoxically more likely to develop concomitant hydrocephalus, demonstrating that comorbidity burden exerts a more pronounced influence on hydrocephalus risk than genetic predisposition in this population.