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Racial Disparities in Glioblastoma Genomic Alterations: A Comprehensive Analysis of a Multi-institution Cohort of 2,390 patients

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Abstract

Background: While molecular biomarkers have significantly advanced precision oncology in glioblastoma, the prevalence of these biomarkers by race remains underexplored. This study aims to characterize the genomic alterations in glioblastoma across Asian, Black, and White patients, offering insights into racial disparities that may influence treatment outcomes and disease progression.

Methods: Analyzing data from the AACR-GENIE database V13.0, this study examined 2,390 primary glioblastoma samples from unique patients. Genomic alterations in 566 cancer-related genes were assessed using targeted next-generation sequencing (NGS) panels from three large cancer institutes. The patient cohort included 112 Asians, 67 Blacks, and 2,211 Whites. Statistical significance of associations between genomic alterations and race was evaluated using the Chi-squared test, with the Benjamini-Hochberg method applied to control for multiple testing adjustments.

Results: Significant racial differences were observed in the frequency of genomic alterations. Asians exhibited a higher frequency of TP53 alterations (52.68%, $P<0.001$), Blacks showed more frequent alterations in NRAS (7.46%, $P<0.001$), MTOR (10.45%, $P=0.039$), and TET2 (8.96%, $P=0.039$), and Whites had a higher occurrence of PTEN alterations (48.67%, $P=0.045$). Additionally, Black patients had an elevated rate of RET deletions (14.29%, $P<0.001$).

Conclusions: This study identifies significant racial disparities in the alteration frequencies of six key glioblastoma genes: NRAS, TP53, MTOR, TET2, PTEN, and RET. These findings underscore the need for racial considerations in glioblastoma treatment strategies and highlight potential avenues for targeted therapeutic interventions. Further research is needed to explore the clinical implications of these genomic disparities.

Keywords: genomics; glioblastoma; precision oncology; racial disparities.