A Narrative Review of Genetic and Epigenetic Factors in Glioblastoma: Implications for Pathogenesis and Therapeutic Strategies

S.N. Suraweera*
Department of Biomedical Science, NSBM Green University, Sri Lanka
M. Hewadikaram
Department of Biomedical Science, NSBM Green University, Sri Lanka
Corresponding Author:saviiisuraweera11@gmail.com

Abstract - Glioblastoma is recognized as one of the most aggressive malignant brain tumors which predominantly affects adults and constitutes 14.7% of all intracranial tumors. It is classified into two main types: Primary Glioblastoma which arises without precursor lesions, and Secondary Glioblastoma which evolves from lower-grade gliomas. Unfortunately, glioblastoma carries a dismal prognosis with a median survival rate of only 14 to 16 months. This study aims to delve into genetic and epigenetic factors that contribute to the progression and treatment responses of glioblastoma thereby facilitating the development of more personalized and therapeutic strategies. A narrative review of existing literature was conducted to highlight the critical genetic alterations and epigenetic modifications including IDH mutations, MGMT-promoter methylation, and TERT promoter mutations alongside their roles in tumor behavior and patient outcomes. The latest World Health Organization Central-Nervous-System Classification 5th edition (2021) glioblastoma classified as a Grade-4 adult-type diffuse glioma by emphasizing the importance of genetic markers for accurate diagnosis. Glioblastoma originates from various cell types in the brain with mutations in these cells driving cancer development. Tumor location significantly impacts prognosis with frontal lobe tumors generally yielding better outcomes than those in the temporal lobe or deep brain structures. Key genetic and epigenetic factors have notable effects on tumor behaviors and treatment responses. Also, modifications like DNA methylation and histone alterations play a crucial role in glioblastoma progression. A comprehensive understanding of the genetic and epigenetic landscape in glioblastoma is essential for developing personalized therapies, improving prognostic stratification, and advancing treatment options. Continued research is vital to address the challenges posed by this aggressive tumor and enhance patient outcomes.

Keywords- Glioblastoma, Genetic and Epigenetic Factors