ABSTRAK

Latar Belakang: Glioma adalah tumor primer yang menyerang sistem saraf pusat, salah satunya otak. Di Amerika Serikat, sekitar 20.000 kasus baru glioma otak terdiagnosis setiap tahunnya. Baku emas untuk diagnosis glioma otak adalah pemeriksaan histopatologi dimana pemeriksaan ini invasif dengan mengambil sampel jaringan otak. Diagnosis glioma otak menggunakan pemeriksaan histopatologi dipengaruhi oleh pengambilan sampel, heterogenitas tumor, dan fitur morfologi yang tumpang tindih. *Magnetic Resonance Imaging* (MRI) menjadi alternatif metode diagnosis secara non-invasif untuk diagnosis, menentukan karakteristik tumor otak, dan menentukan rencana terapi. Penilaian fitur glioma otak pada hasil MRI dapat dilakukan dengan menggunakan fitur *Visually Accessible Rembrandt Images* (VASARI). Fitur VASARI tersebut bisa digunakan untuk menilai karakteristik perluasan lesi dari glioma otak, yang terdiri dari *edema crosses midline*, *pial invasion*, *ependymal extension*, *cortical involvement*, *deep white matter invasion*, nCET (*non-Contrast Enhancing Tumor*) *crosses midline*, CET (*Contrast Enhancing Tumor*) *crosses midline*, dan *calvarial remodeling*. Biomarker molekuler, seperti status mutasi IDH, metilasi MGMT, dan indeks proliferasi Ki-67, juga penting diketahui karena berhubungan dengan prognosis pasien sehingga bisa segera dilakukan penanganan yang tepat. Saat ini, belum banyak penelitian tentang hubungan fitur VASARI pada gambaran MRI dengan biomarker molekuler pada pasien glioma otak di Indonesia.
Tujuan: Mengetahui hubungan karakteristik perluasan lesi dari MRI kepala terhadap status mutasi IDH, metilasi MGMT, dan indeks proliferasi Ki-67 pada pasien glioma otak di RSUP Dr. Sardjito Yogyakarta tahun 2017–2022.
Metode: Penelitian ini menggunakan desain penelitian observasional analitik yang dilakukan secara potong lintang dengan mengambil data secara berurutan (*consecutive sampling*) dan secara retrospektif dari data rekam medis dan pencitraan MRI kepala pasien glioma di RSUP Dr. Sardjito Yogyakarta pada rentang tahun 2017-2022. Uji bivariat dilakukan dengan menggunakan uji *Chi-square* untuk mengetahui hubungan antarvariabel.
Hasil: Terdapat hubungan yang signifikan antara fitur VASARI nCET *crosses midline* dan CET *crosses midline* dengan status mutasi IDH (p=0,002; p=0,021), *edema crosses midline* dan *calvarial remodeling* dengan metilasi MGMT (p=0,007; p=0014), dan *pial invasion* dengan indeks proliferasi ki-67 (p=0,008). Variabel perancu berupa derajat glioma memiliki pengaruh yang signifikan terhadap hubungan antara *pial invasion* dengan indeks proliferasi ki-67.
Kesimpulan: Terdapat hubungan yang signifikan antara karakteristik perluasan lesi dari MRI kepala terhadap status mutasi IDH, metilasi MGMT, dan indeks proliferasi Ki-67 pada pasien glioma otak.
Kata kunci: Glioma otak, perluasan lesi, MRI, mutasi IDH, metilasi MGMT, indeks proliferasi Ki-67, VASARI.

ABSTRACT

Background: Glioma is a primary tumor that attacks the central nervous system, one of which is the brain. In the United States, around 20,000 new cases of brain glioma are diagnosed each year. The gold standard for the diagnosis of brain glioma is histopathological examination, which is invasive by taking brain tissue samples. The diagnosis of brain glioma using histopathological examination is influenced by sampling, tumor heterogeneity, and overlapping morphological features. Magnetic Resonance Imaging (MRI) is an alternative non-invasive diagnostic method for diagnosis, determining brain tumor characteristics, and determining therapy plans. Assessment of brain glioma features on MRI results can be done using the Visually Accessible Rembrandt Images (VASARI) feature. The VASARI features can be used to assess the characteristics of lesion expansion from brain glioma, which consists of edema crosses midline, pial invasion, ependymal extension, cortical involvement, deep white matter invasion, nCET (non-Contrast Enhancing Tumor) crosses midline, CET (Contrast Enhancing Tumor) crosses midline, and calvarial remodeling. Molecular biomarkers, such as IDH mutation status, MGMT methylation, and Ki-67 proliferation index, are also important to know because they are related to patient prognosis so that appropriate treatment can be carried out immediately. Currently, there has not been much research on the relationship between VASARI features on MRI images with molecular biomarkers in brain glioma patients in Indonesia.

Objective: To determine the relationship between lesion extension characteristics from head MRI with IDH mutation status, MGMT methylation, and Ki-67 proliferation index in brain glioma patients at Dr. Sardjito General Hospital Yogyakarta in 2017–2022.

Methods: This study used an analytical observational study design conducted cross-sectionally by taking data sequentially (consecutive sampling) and retrospectively from medical records and MRI imaging of the head of glioma patients at Dr. Sardjito General Hospital Yogyakarta in the period 2017-2022. Bivariate tests were performed using the Chi-square test to determine the relationship between variables.

Results: There was a significant relationship between the VASARI nCET crosses midline and CET crosses midline features with IDH mutation status (p=0.002; p=0.021), edema crosses midline and calvarial remodeling with MGMT methylation (p=0.007; p=0014), and pial invasion with the ki-67 proliferation index (p=0.008). The confounding variable in the form of glioma grade had a significant effect on the relationship between pial invasion and the ki-67 proliferation index.

Conclusion: There is a significant relationship between the characteristics of lesion extension from head MRI to IDH mutation status, MGMT methylation, and Ki-67 proliferation index in brain glioma patients.

Keywords: Brain glioma, lesion extension, MRI, IDH mutation, MGMT methylation, Ki-67 proliferation index, VASARI.