Factors that Influence Survivability of Individuals with Brain Cancer

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Introduction

About 14.4% of all new cancer cases in the US are brain cancer (“Cancer of the Brain and Other Nervous System – Cancer Stat Facts”). This year, it is estimated that 23,020 adults in the United States will be diagnosed with primary cancerous tumors of the brain and spinal cord and 17,760 adults will die from brain cancer this year (“Brain Tumor – diagnosed with primary cancerous tumors of the brain and spinal cord”). The possible to approximate and compare the survivability of individuals based on their descriptive, phenotypic, and genotypic characteristics. The objective of this study was to analyze the effects of race, gender, sex, age, diagnosis, and genetic mutations on the survivability of individuals with brain cancer from The Cancer Genome Atlas data portal.

Statistical Methods

1. Descriptive Statistics: A summary of the data was made characterizing the four key diagnoses by sex, race, and age of primary diagnosis. Percentages may not add to 100% due to rounding.

<table>
<thead>
<tr>
<th>Diagnosis</th>
<th>Sex</th>
<th>Race</th>
<th>Age at Dx.</th>
<th>Median</th>
<th>10th</th>
<th>25th</th>
<th>75th</th>
<th>90th</th>
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</thead>
<tbody>
<tr>
<td>Glioblastoma</td>
<td>M</td>
<td>1</td>
<td>66</td>
<td>44.92</td>
<td>10.90</td>
<td>24.77</td>
<td>74.00</td>
<td>89.30</td>
</tr>
<tr>
<td></td>
<td>F</td>
<td>1</td>
<td>66</td>
<td>44.92</td>
<td>10.90</td>
<td>24.77</td>
<td>74.00</td>
<td>89.30</td>
</tr>
<tr>
<td>Astrocytoma</td>
<td>M</td>
<td>1</td>
<td>66</td>
<td>44.92</td>
<td>10.90</td>
<td>24.77</td>
<td>74.00</td>
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<td>F</td>
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<td>66</td>
<td>44.92</td>
<td>10.90</td>
<td>24.77</td>
<td>74.00</td>
<td>89.30</td>
</tr>
<tr>
<td>Oligodendroglioma</td>
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<td>1</td>
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<td>44.92</td>
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<td>24.77</td>
<td>74.00</td>
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<td></td>
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<td>66</td>
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<tr>
<td>Mixed Glioma</td>
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<td>66</td>
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<td>10.90</td>
<td>24.77</td>
<td>74.00</td>
<td>89.30</td>
</tr>
</tbody>
</table>

2. ANOVA Test: An ANOVA test on the age of diagnosis was run.

   • Survival difference between races is not significantly different (p>.5).
   • Age at diagnosis in Astrocytoma and Mixed Glioma are not significantly different (p>.05).
   • Survival times are different for Glioblastoma vs. Astrocytoma (p<.05), Oligodendroglioma vs. Mixed Glioma (p<.05), Glioblastoma vs. Oligodendroglioma (p<.05), and Glioblastoma vs. Oligodendroglioma (p<.05).
   • Cox regression model, testing age, sex, diagnosis, and race simultaneously, age (p=.05) and diagnosis (p=.05) are the only two significant predictors of survival.

3. Multiple Correspondence Analysis: From 20,770 genes, the five genes most commonly mutated and with significant survival time were selected. An MCA was created using indicators of the genes (mutations/mutations) to classify differences and relationships between the four diagnoses.

Conclusions

• Across all four primary diagnoses, there was a higher percentage of males than females.
• Patients’ age at diagnosis with Glioblastoma is significantly different from the other diagnoses (p<.05).
• Age at diagnosis in Astrocytoma and Mixed Glioma are not significantly different (p>.05).
• Survival time is different for Glioblastoma vs. Astrocytoma (p<.05), Oligodendroglioma vs. Mixed Glioma (p<.05), Glioblastoma vs. Oligodendroglioma (p<.05), and Glioblastoma vs. Oligodendroglioma (p<.05).

Acknowledgements

The R25 program and this research is supported by funding from the National Cancer Institute through the R25-CA134283 grant. We appreciate the support of the James Graham Brown Cancer Center and University of Louisville School of Medicine.

References

   tumor/brainstats.