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Expanding our knowledge of brain tumor overall survival trends at a global scale

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Disease burden in a population is assessed using different critical measurements such as incidence, the proportion of newly diagnosed individuals, and survival, most commonly overall survival typically defined as time from diagnosis to death from any cause. In order to gain insight into a disease, both incidence and survival are studied for trends to determine how much disease has been diagnosed over time (incidence trends) and how effective treatments and other health care management have been over time (survival trends). Understanding these critical measurements, at a global scale, is important for a clear understanding of disease burden.

CONCORD is a program designed for global surveillance of cancer survival and survival trends (https://csg.lshtm.ac.uk/research/themes/concord-programme/).[1] In the third cycle of CONCORD, CONCORD-3, individuals with cancer from 322 population-based registries in 71 countries diagnosed between 2000 and 2014 with the 18 most common cancers worldwide were included. Hence, CONCORD-3 is now the largest population-based dataset designed for studying cancer survival in the world, including over 37 million individuals representing ~75% of all cancers diagnosed worldwide each year. Two companion studies recently published in *Neuro Oncology* leveraged this unique worldwide dataset to study global survival trends for adults[2] and children[3] with brain tumors.

Both studies utilized similar methods. In brief, individuals diagnosed with a primary malignant or non-malignant brain tumor between 2000 and 2014 were used to examine overall age-standardized net survival trends.[2,3] International Classification of Disease Oncology codes version 3 (ICD-O-3)[4] were used to group the individuals into histopathology groups under the 2007 World Health Organization rubric.[5] Age-standardized net survival up to 5 years after diagnosis was estimated overall and also stratified by country, year of diagnosis period, and histopathology group. Net survival can be interpreted as the probability of survival after diagnosis controlling for competing risks of death (e.g., background mortality). The classical cohort approach, combined with the period approach, was used to look at survival trends between the year of diagnosis periods: 2000–2004, 2005–2009, and 2010–2014. The CONCORD-3 data were subject to a rigorous quality control processes to ready the data for analysis as described elsewhere.[1]

The manuscript studying adults used data from 556,237 adults (aged 15–99 at diagnosis; 82.9% of all individuals after data quality control steps) diagnosed between 2000 and 2014 from 59 countries.[2] These were grouped into 11 major histopathology groups relevant to adult brain tumors.[2] In general, age-standardized 5-year net survival varied by histopathology group and country. The 5-year net survival for diffuse and anaplastic astrocytoma ranged from 20% to 38% while the range for oligodendroglioma was 32% to 69%. For glioblastoma, the most common type of primary malignant brain tumor in adults, the 5-year net survival ranged from 4% to 17% and the largest gains in survival occurred between the periods 2000–2004 and 2005–2009. The Stupp Protocol, the current standard of care for glioblastoma, was introduced between these periods[6] and could be one reason why a survival improvement is observed between these periods. In addition, the authors showed there are wide disparities in age-standardized 5-year net survival, especially in adolescents and young adults. Age-standardized 2-year net survival was also calculated for glioblastoma and showed wide variability for young adults (aged 15–39 years at diagnosis) ranging from 30% to 70%. The authors recommend that additional efforts to provide equitable access and complete care to this understudied group are needed. While other histopathologies were studied, data were sparse, as this information was not widely available across countries.

The manuscript studying children used data from 67,776 children (aged 0–14 years at diagnosis; 94.8% of all individuals after data quality control steps) diagnosed between 2000 and 2014 from 61 countries.[3] These were grouped into 12 major histopathology groups relevant to pediatric brain tumors.[3] To make the histopathology groupings more clinically relevant, the authors devised an enhanced version of the ICCC-3[7] to help standardize the data and account for differences

in worldwide cancer registration. Survival also varied by histopathology group and country for pediatric brain tumors, with some histopathologies showing a wide survival range. Age-standardized 5-year net survival was as high as 84% to 100% for low-grade astrocytoma, much lower for high-grade astrocytoma at 6.3% to 31.2%, and also low for medulloblastoma at 47% to 86%. Like the adult study, other histopathologies were studied, however, data were sparse, as this information was not widely available across countries.

In a recent study of changes in overall survival over time for the United States using the Central Brain Tumor Registry of the United States (CBTRUS) dataset (www.cbtrus.org), similar improvements in survival in more recent years were also observed.[8] Additionally, improvements in survival over time were also seen for specific histopathologies, both malignant and non-malignant, by age at diagnosis.

Survival trend data for both adults and children with primary malignant and non-malignant brain tumors are critical to improving both our understanding of worldwide disease burden and the effectiveness of treatment over time. Although a rare tumor type, brain tumors contribute disproportionately to morbidity and mortality. Results from these studies show wide variability by country, age at diagnosis group (adult versus pediatric), and histopathology grouping, thus providing evidence for the need for more standardized diagnoses and treatment approaches to provide the best and most equitable care worldwide.

Disclosure Statement

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References

1. Allemani C, Matsuda T, Di Carlo V, et al. Global surveillance of trends in cancer survival 2000-14 (CONCORD-3): analysis of individual records for 37 513 025 patients diagnosed with one of 18 cancers from 322 population-based registries in 71 countries. *Lancet*. 2018;391(10125):1023–1075. Epub June 2, 2018.
2. Girardi F, Matz M, Stiller C, et al. Global survival trends for brain tumors, by histology: analysis of individual records for 556,237 adults diagnosed in 59 countries during 2000-2014 (CONCORD-3). *Neuro Oncol*. 2023;25(3):580–592.
3. Girardi F, Di Carlo V, Stiller C, et al. Global survival trends for brain tumours, by histology: analysis of individual records for 67,776 children diagnosed in 61 countries during 2000-2014 (CONCORD-3). *Neuro Oncol*. 2023;25(3):593–606
4. Fritz A, Percy C, Jack A, Shanmugaratnam K, Sobin L, Parkin DM, Whelan S. *International Classification of Diseases for Oncology—Third Edition*. Geneva: World Health Organization; 2000.
5. Louis DN, Ohgaki H, Wiestler OD, et al. The 2007 WHO classification of tumours of the central nervous system. *Acta Neuropathol*. 2007;114(2):97–109.
6. Stupp R, Mason WP, van den Bent MJ, et al.; European Organisation for Research and Treatment of Cancer Brain Tumor and Radiotherapy Groups. Radiotherapy plus concomitant and adjuvant temozolomide for glioblastoma. *N Engl J Med*. 2005;352(10):987–996.
7. Surveillance Epidemiology aERSP SE. *ICCC Recode Third Edition ICD-O-3/IARC 2017*. U.S Department of Health and Human Services; 2017 [cited November 28, 2022]. Available from: https://seer.cancer.gov/iccc/iccc-iarc-2017.html#fn.
8. Cioffi G, Waite KA, Edelson JL, Kruchko C, Ostrom QT, Barnholtz-Sloan JS. Changes in survival over time for primary brain and other CNS tumors in the United States, 2004-2017. *J Neurooncol*. 2022;160(1):209–219. Epub October 6, 2022.