Primary Central Nervous System Tumors: Comparison of Two National Cancer Registries

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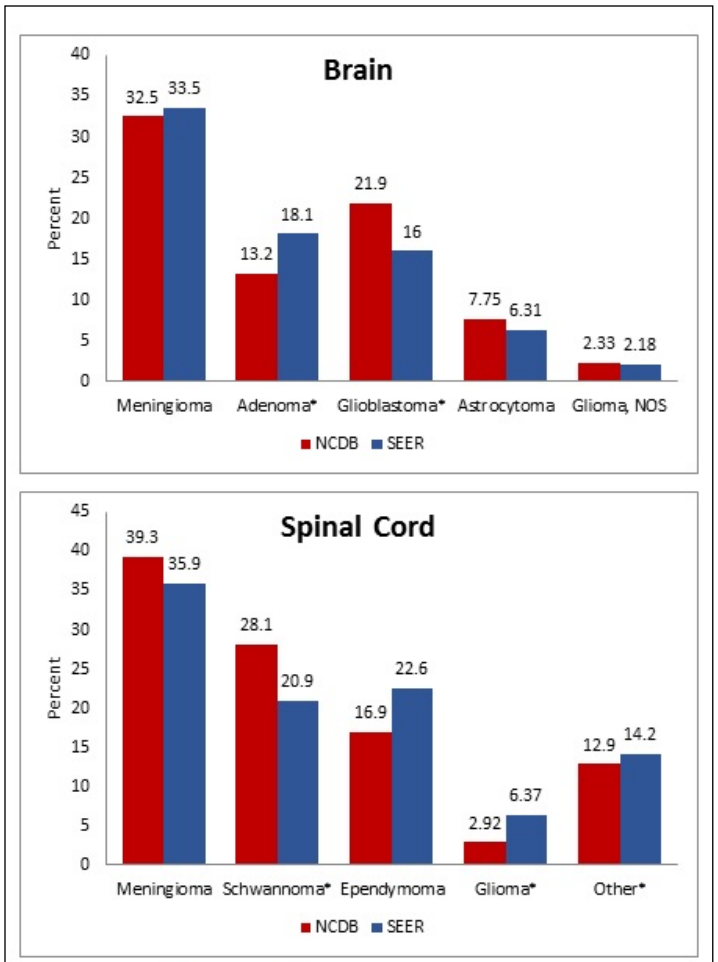
Introduction

Primary central nervous system(CNS) tumors arise from brain and spinal cord and have an incidence rate of 28.6 per 100,000 people. Primary CNS tumors are included in the two most commonly utilized cancer registries/databases, National Cancer Database(NCDB) and Surveillance, Epidemiology, and End Results(SEER). However, there are some fundamental differences between the two which have to do with the sampling frame as well as the patient, facility, tumor and treatment characteristics. We analyzed primary CNS tumor cases in United States by using NCDB and SEER; we aim to obtain more clear idea about how closely they represent the population in United States in terms of all primary CNS tumors.



* = Standardized Difference >0.10

Methods

Patients with primary CNS (brain and spinal cord) tumors from 2004 through 2013 were identified using the International Classification of Diseases for Oncology, 3rd edition topographical codes. Patient demographics, tumor characteristics and treatment-related variables were compared between the two databases using standardized differences (sd. diff), with values greater than 0.1 denoting statistical significance

Results

A total of 588,534 primary brain tumor patients were identified. 416,162 patients in NCDB had a mean age(SD) of 56.7(19.4) and 172,372 patients in SEER had a mean age(SD) of 53.6(19.7). A total of 34,827 primary spinal cord tumor patients were identified. 26,602 patients in NCDB had a mean age(SD) of 52.7(19.1) and 8,225 patients in SEER had a mean age(SD) of 50.3(20.1). There were statistically significant differences with regards to age, Hispanic origin, and income between the two databases for both tumors.

Treatment Characteristics

Variable	Brain			Spine		
	NCDB (n=416162)	SEER (n=172372)	Standardized difference	NCDB (n=26602)	SEER (n=8225)	Standardized difference
KPS, median (interquartile range)	80 (70-90)	.		80 (60-90)	.	
Start of the treatment, days from diagnosis, median (interquartile range)	5 (0-29)	.		0 (0-19)	.	
Surgery, n(%)						
Yes	240513 (57.8)	89145 (51.7)		22902 (86.1)	6750 (82.1)	
No	174105 (41.8)	80530 (46.7)	**0.14**	3656 (13.7)	1428 (17.4)	**0.12**
Unknown	1544 (0.37)	2697 (1.56)		44 (0.17)	47 (0.57)	
First surgical procedure, day from diagnosis, median (interquartile range)	3 (0-21)	.		0 (0-17)	.	
Inpatient stay after surgery, days, median (interquartile range)	4 (2-6)	.		4 (3-6)	.	
Readmission in 30 days, n(%)	16131 (3.88)	.		1314 (4.94)	.	
30 day mortality, n(%)	6312 (1.52)	.		125 (0.47)	.	
90 day mortality, n(%)	15802 (3.80)	.		285 (1.07)	.	
Radiotherapy, n(%)						
Yes	126982 (30.5)	43189 (25.1)		2275 (8.6)	879 (10.7)	
No	283591 (68.1)	126693 (73.5)	**0.12**	23818 (89.5)	7304 (88.8)	**0.11**
Unknown	5589 (1.34)	2490 (1.44)		509 (1.91)	42 (0.51)	
Type of radiotherapy, n(%)	n=126982			n=2275		
IMRT	35990 (28.3)	.		463 (20.4)	.	
Photon	36693 (28.9)	.		874 (38.4)	.	
Conformal or 3D	9592 (7.55)	.		170 (7.47)	.	
External Beam, NOS	20481 (16.1)	.		402 (17.7)	.	
Other	22224 (17.5)	.		336 (14.8)	.	
Unknown	2002 (1.58)	.		518 (22.8)	.	
Timing of Radiotherapy, n(%)						
Adjuvant	82290 (19.8)	27456 (15.9)		1658 (6.23)	624 (7.59)	
Neoadjuvant	722 (0.17)	280 (0.16)		31 (0.12)	9 (0.11)	
Adjuvant + Neoadjuvant	165 (0.04)	125 (0.07)		2 (0.008)	2 (0.02)	
Intraoperative	88 (0.02)	31 (0.02)	**0.90**	1 (0.004)	2 (0.02)	**0.12**
Intraoperative + adjuvant or neoadjuvant	53 (0.01)	16 (0.01)		.	.	
Surgery before & after radiation	.	6 (0.003)		.	.	
No radiation and/or surgery	324904 (78.1)	144271 (83.7)		24391 (91.7)	7580 (92.2)	
Unknown	7940 (1.91)	187 (0.11)		519 (1.95)	8 (0.10)	
Chemotherapy, n(%)	86491 (20.8)	.		611 (2.3)	.	
Vital Status, n(%)						
Dead	160406 (38.5)	56742 (32.9)	**0.12**	3401 (12.78)	1051 (12.8)	<0.001
Alive	255756 (61.5)	115630 (67.1)		23201 (87.2)	7174 (87.2)	

Discussion

Representativeness of the actual population is an important factor for databases. Comparison of SEER and NCDB populations with US Population was made with regards to distribution of age, sex, race and Hispanic ethnicity. In addition to these variables, distribution of the population according to regions/divisions were analyzed, as it is done in the study by Mettlin et al, which compared NCDB and SEER for 4 types of tumors (breast, lung, colon, prostate). Two databases show different distributions than US population with regards most variables, except sex and region/division. Correspondingly with Mettlin study10, distribution of NCDB population according to regions/divisions is very similar to actual US population.

Research directions

Utilization of large scale databases, including national cancer registries is becoming increasingly more common. Therefore, it is important for researchers to know which database to go for the area they are interested in. In terms of both primary CNS tumors and general population, NCDB and SEER have different aspects that should be taken into account. If the researcher is investigating facility and treatment characteristics for a specific condition, NCDB will be a better option to get more detailed information as it is done in a recent study by Wang et al. For epidemiological data and cancer specific survival, SEER registry should be the preferred database to use. An example of this can be seen in the study from Li et al., which presents cancer related mortality and mortality caused by other conditions for pancreatic cancer patients using SEER. Another point about the databases is, as a facility-based database, NCDB has much more information about treatment characteristics.

Conclusions

It is seen that, two databases differ significantly from most aspects. NCDB, as a facility-based cancer registry, is better in terms of reflecting facility characteristics and detail characteristics related to treatments(inpatient stay after surgery, readmission, 30 and 90-day mortality) and SEER, as a population-based registry, is better in terms of reflecting demographics. However NCDB has data of more patients and has more coverage across the United States, which is also a strong predictor for representativeness.