

## Epidemiology of Primary Brain Tumors in Young Women Aged 18-35 in the Lviv Region (West of Ukraine) During 1992-2018

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### ABSTRACT

Brain cancer is classified based on the World Health Organization's (WHO) histological classification system, which focuses on the tumor's biological behavior (ICD-10-CM Diagnosis Code C71). Brain cancer is one of the most aggressive and difficult-to-treat malignancies. Primary malignant brain tumors are rare, accounting for 1.4% of new cancer diagnoses in the United States and 2.7% of deaths due to cancer.

**Keywords:** Young women, Brain tumor, Ukraine

### INTRODUCTION

Primary brain cancer is the third most common cause of cancer deaths in adults aged 15 to 34 [1-4]. American Brain Tumor Age-standardized incidence rate (Ukrainian standard) of brain tumor among women in Lviv region due to Bulletin of National Cancer Registry of Ukraine (2016-2017) contains 5.5 per 100,000 [5]. In Ukraine age-standardized incidence rate (Ukrainian standard) is smaller and is 4.2 per 100,000. In 2016 brain cancer among females in Ukraine was second only to deaths (11.5%) in the age group of 18-29 years.

Understanding the epidemiology of such tumors, as well as the underlying genetics, will help to tackle this devastating disease. Environmental factors may also contribute to the increased risk of brain tumor in young people. The role of carcinogens in the etiology of brain tumors is controversial, but limited studies do demonstrate factors that are prevalent in the youth that includes smoking and pollution [6,7].

Primary brain cancer can be categorized into 2 types: gliomas and non-gliomas. Malignant gliomas originate in the glial cells of the CNS and are the more common and more lethal form of brain malignancies. Non-gliomas do not originate in the glial cells of the CNS. These tumors develop in other parts of the brain. Some examples of non-gliomas include meningiomas and medulloblastomas [7,8].

Brain cancer does not have a specific staging system that is capable of accurately predicting the cancer's development and likely outcome. The TNM system is not an appropriate

tool for brain cancer because most brain and spine cancers are unable to spread to other organs (metastasize).

Despite a lack of progress in the clinic, research on this group of conditions is advancing steadily and treatments with the potential to transform the field are on the horizon [9-11].

### AIM OF OUR STUDY

It was to assess the epidemiology characteristics in young women with brain tumor from Lviv region (Ukraine) during 1992-2018.

### MATERIALS AND METHODS

This retrospective study evaluated in 195 female patients with brain tumor aged 18-35 years (median 28.2 ± 6.4) from Lviv region (West Ukraine) who were diagnosed and followed-up over a period of 27 years (1992-2018) in the Cancer Register of Lviv Oncologic Regional Treatment and Diagnostic Center.

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We used the Cancer Register of our region, which contains the largest aggregation of population-based data on the incidence of primary central nervous system tumors in the Lviv region (West Ukraine) to describe these tumors.

The following key variables were extracted and utilized: year of diagnosis, age at diagnosis, registry, discrete at diagnosis, region at diagnosis, diagnostic confirmation, reporting source and type of treatments.

## RESULTS

We obtained the latest available population-based data on all newly diagnosed primary brain tumors from the Lviv Cancer Register (West of Ukraine) in 1992-2018. We studied cohort of young women from 20 districts of Lviv region and Lviv town during these years. According to the Statistical Office on April 2018 population was 2,526,500 persons, including 1,321,600 women (52.3%) in Lviv region (West Ukraine) [12]. Every year in the Lviv region about 5-11 young women of different ages are found to have confirmed brain tumor. Age of patients ranged from 18 to 35 years (median of 28.2 ± 6.4 years).

A total of 195 (**Table 1**) primary brain tumor patients were selected from the Lviv Cancer Register database. In which the most common cases were gliomas - 101 (51.8%). In our study were two main types of glioma: astrocytoma (30 cases -15.4%) and oligodendroglioma (12 cases - 6.2%). The most common types of brain tumor in young women were anaplastic astrocytoma (astrocytoma, grade 3) - 20 (10.3%) cases and glioblastoma (astrocytoma, grade 4) - 22 (11.3%)

**Table 1.** Age characteristics of diagnosis among women with brain tumors from the Lviv Cancer Register (West of Ukraine) in 1992-2018.

No.	Diagnosis	Age of patient's										
		18-20		21-25		26-30		31-35		18-35		
		n	%	n	%	N	%	n	%	n	%	
1	<b>Gliomas</b>											
	Anaplastic astrocytoma	2	1.0	3	1.5	7	3.6	8	4.1	20	10.3	
	Astrocytoma	3	1.5	7	3.6	8	4.1	12	6.2	30	15.4	
	Diffuse astrocytoma	-	-	3	1.5	3	1.5	6	3.1	12	6.2	
	Oligoastrocytoma	-	-	1	0.5	1	0.5	1	0.5	3	1.5	
	Oligodendroglioma	1	0.5	2	1.0	3	1.5	5	2.6	11	5.6	
	Xantoastrocytoma	-	-	1	0.5	-	-	-	-	1	0.5	
	Glioblastoma	2	1.0	3	1.5	7	3.6	10	5.1	22	11.3	
	Gliosarcoma	-	-	-	-	-	-	1	0.5	1	0.5	
	Astroblastoma	-	-	-	-	-	-	1	0.5	1	0.5	
All Gliomas	8	4.1	20	10.3	29	14.9	44	22.6	101	51.8		

cases. Anaplastic ependymoma met in 8 (4.1%) cases. Malignant neoplasm - 66 (33.8%) ranks second among brain tumors in women of young age. The third place was taken by meningioma malignant -13 (6.7%). Mesenchymal malignant, a group of rare tumors that includes angioleiomyosarcoma and hemangiosarcoma, comprises 1.5% of all brain tumors.

With age, the number of pathology increased. The incidence rate for malignant brain tumors in aged 18-20 – 13 (6.7%) cases is significant less than 31-35 years old – 85 (43.6%),  $p < 0.05$ . In each age group's there was an increase in the number of all brain tumors with age. There was no difference ( $p > 0.05$ ) almost among groups aged 21-25 (44 cases – 22.6%) and 26-30 (53 cases – 27.2%).

The amount of glioblastoma significant increased ( $p < 0.05$ ) with the age requirement of 2 (1%) cases at the age of 18-20 years to 10 (5.1%) cases aged 31-35.

Independently of age dominated glial tumors among young women with brain tumors, especially at the age of 26-30 years – 29 (14.9%) cases and 44 (22.6%) in group 31-35 aged. The significant lowest age of the onset of glial tumors ( $p < 0.05$ ) were in group 18-20 aged – 8 (4.1%) cases than in group 31-35 aged.

The lowest age of the onset of malignant neoplasm was in the group 18-20 aged – 5 (2.6%) cases. Conversely, malignant neoplasm peak in incidence – 31 (15.9%) cases at aged 31-35 (**Table 1**).

		Meningioma malignant									
2	Meningioma malignant	-	-	4	2.1	3	1.5	6	3.1	13	6.7
		Ependymal									
3	Anaplastic ependymoma	-	-	2	1.0	4	2.1	2	1.0	8	4.1
		Mesenchymal									
4	Angioleiomyosarcoma	-	-	1	0.5	-	-	1	0.5	2	1.0
	Hemangiosarcoma	-	-	-	-	1	0.5	-	-	1	0.5
		Embryonal									
5	Medulloblastoma	-	-	2	1.0	1	0.5	1	0.5	4	2.1
6	<b>Malignant neoplasm</b>	5	2.6	15	7.7	15	7.7	31	15.9	66	33.8
7	<b>All</b>	13	6.7	44	22.6	53	27.2	85	43.6	195	100

Medulloblastoma was relatively rare and account for 2.1% (4 cases) of all primary brain tumors which coincides with the data [13]. At the age of 21-25 years were diagnosed two cases (1%) of this pathology in women from Lviv region.

Epidemiological data among 195 female patients with brain tumor from Lviv region during 1992-2018 showed that there were two cases (1%) compared with other tumor. A woman B. 31 years old was diagnosed with rhabdomyosarcoma of the lung for which pneumoectomy was performed. Nine months later suspected anaplastic astrocytoma. Patient refused from treatment and dead one year after diagnosis. A patient F at the age of 34 years found leukemia and malignant neoplasm of brain simultaneously. Woman received palliative chemotherapy due to leukemia. The patient died 3 months after the diagnosis was established.

Gliomas can be low grade (slow growing) or high grade (fast growing). Doctors used the grade to decide which treatment they need. The position of the tumor was also very important. Primary brain tumors were treated using a multipronged approach that can involve surgery, radiotherapy or chemotherapy (Table 2). Among 195 women 34 (17.4%) patients were refused from treatment. The rest of 161 (82.6%) young women received different treatment (Table 2): radical treatment – 77 (39.5%), palliative – 84 (43.1%).

For brain tumors, surgery 44 (22.6%) was the first choice of treatment to help relieve symptoms and increase patient survival. Treatment began with maximal surgical removal of the tumor. When surgery could not be done, then chemotherapy with or without radiation therapy were used. The addition of radiation to the entire neuraxis and chemotherapy helped improve survival.

**Table 2.** Different treatment among young women aged 18-35 with brain tumor from Lviv region (Ukraine) during in 1992-2018.

Treatment	Type of therapy												Refuse	
	Rt	Surgery	Chemotherapy	Rt+Sur	Rt+Chem	Sur+Rt	Chem+Rt	Sur+Chem	Rt+Sur+Chem	Rt+Chem+Sur	Sur+Rt+Chem	Chem+Sur+Rt		All
<b>Radical</b>	3	27	1	2	1	21	1	5	1	1	12	2	77	<b>34</b>
<b>Palliative</b>	4	17	5	3	7	20	3	0	2	1	19	3	84	
<b>All</b>	7	44	6	5	8	41	4	5	3	2	31	5	161	

Rt: Radiation Therapy; Chem: Chemotherapy; Sur: Surgery

Only radiation therapy was applied in 7 (3.6%) women – 3 radical and 4 palliative cases. Only chemotherapy drugs

were used in 6 (3.1%) women. Surgery with chemotherapy without radiation therapy was observed in 5 (2.6%) patients.

In most cases treatment was include some combination of surgery, radiation therapy and chemotherapy. Radiation therapy with chemotherapy (**Table 2**) were given in 8 (4.1%), radiation with surgery – in 5 (2.6%) cases. Radiation therapy with chemotherapy and surgery were used in 2 (1%) cases, radiation therapy with surgery and chemotherapy – 3 (1.5%) cases.

Radiation therapy was used after surgery or chemotherapy in 76 (39%) cases. In 5 (2.6%) cases radiation therapy was given after surgery and chemotherapy.

In our study combinations of treatments with radiation therapy was used for treatment brain tumor in 140 (71.8%) cases.

## CONCLUSION

1. This retrospective study evaluated in 195 female patients with brain tumor aged 18-35 years (median  $28.2 \pm 6.4$ ) from Lviv region (West Ukraine) who were diagnosed and followed-up over a period of 27 years (1992-2018) in the Cancer Register of Lviv Oncologic Regional Treatment and Diagnostic Center.
2. The incidence rate for malignant brain tumors in aged 18-20 – 13 (6.7%) cases is significant less than 31-35 years old – 85 (43.6%),  $p < 0.05$ .
3. The most common cases among ill women of young age from Lviv region were gliomas – 101 (51.8%). Malignant neoplasm – 66 (33.8%) ranks second among brain tumors of these patients.
4. Among 195 women 34 (17.4%) patients were refused from treatment. The rest of 161 (82.6%) young women received different treatment in our study combinations of treatments with radiation therapy were used for treatment brain tumor in 140 (71.8%) cases.

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