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Clinico-epidemiological study of central nervous system tumors at clinical oncology department Tanta University Hospitals

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Abstract
Background: The most common malignant tumor among central nervous system (CNS) tumors is glioblastoma which has the highest mortality rate. On the other hand, meningioma is known as the most common benign tumor. This work aimed to describe the clinico-epidemiological and pathological pattern of all CNS tumors and to evaluate treatment output (Survival details).
Methods: This retrospective study was carried out on 340 patients with CNS tumors. The treatment options depend on several factors, including the type and location of the tumor, how far it has grown or spread and a person's age and overall health [Surgery (craniotomy), radiotherapy, chemoradiotherapy and chemotherapy.
Results: The estimated median overall survival of CNS tumors patients was 36 months, also 5-year OS was reported in 48.5% of these patients. Age, pathology and grade that affect progression free survival of CNS tumors which were significantly different (p<0.001). Also, the comorbidities (HTN, diabetes mellitus) were significantly affecting progression free survival (p<0.05). Estimated median disease-free survival (DFS) of CNS tumors patients which was 22 months, and 20.4% of these patients had 5-year DFS. HTN, pathology and grade that affect DFS of CNS tumors patients which were statistically significant (p<0.001).
Conclusion: Glioblastoma is the most common pathological type followed by atypical meningioma and diffuse astrocytoma. Frontal lobe is the most common site followed by temporal, tempro-parietal lobes.

Keywords: Epidemiology, central nervous system, tumors, Tanta University, glioblastoma

Introduction
Primary tumors of the central nervous system (CNS) are a heterogeneous group of neoplasms that include benign and malignant tumors, which are known as tumors in the brain and spinal cord. Various factors such as age, race, ethnicity, gender, environmental factors, hormones, and genetics can play a role in the etiology of CNS tumors [1].
More than 100 types of tumors that are histologically different are known as subtypes of CNS tumors. The incidence of each tumor varies with age and tissue involved [2].
These tumors include glioma, astrocytoma, embryonal tumors, meningioma, and medulloblastoma. Pituitary and pineal gland tumors are other CNS tumors [3].
The most common malignant tumor among CNS tumors is glioblastoma which has the highest mortality rate. On the other hand, meningioma is known as the most common benign tumor [4]. The aim of this work was to describe the clinico-epidemiological and pathological pattern of all CNS tumors and to evaluate treatment output (survival details).

Patients and Methods
This retrospective study was carried out on 340 patients with CNS tumors. The study was done from January 2015 to December 2020 after approval from the Ethical Committee Tanta University Hospitals, Tanta, Egypt. An informed written consent was obtained from the patients. All patients were subjected to history taking, clinical examination [General examination (general appearance, vital signs, head and neck, chest, upper and lower limb examination) and local examinations (reflexes, muscle strength, vision, eye and mouth movement, coordination, balance, alertness, bladder and bowel problems)], pathological

finding [through stereotactic (needle) biopsy and surgical or open biopsy (craniotomy)], laboratory investigations [Complete blood count (CBC), kidney and liver function tests] and radiological investigations [computed tomography (CT) brain, magnetic resonance sound (MRI) brain and spinal cord, magnetic resonance spectroscopy (MRS) and CT angiography (CTA)].

Line of treatment

The treatment options depend on several factors, including the type and location of the tumor, how far it has grown or spread and a person's age and overall health [Surgery (Craniotomy), radiotherapy, chemoradiotherapy and chemotherapy].

Follow up: Details of the follow up either clinical, radiological or laboratory were revised evaluating response, progression and complication of the treatment.

Statistical analysis

Statistical analysis was done by SPSS v26 (IBM Inc., Chicago, IL, USA). Quantitative variables were presented as mean and standard deviation (SD). Qualitative variables were presented as frequency and percentage (%). Kaplan-Meier Survival curve used to evaluate disease free survival (DFS): It is measured by the period between start of treatment and recurrence of the disease either locally or at distant site or till the last follow up. Overall survival (OS): It is measured by the period between diagnosis of the disease and death for any cause (including tumor progression) or till the last follow up.

Results

Distribution of the studied cases according to year, demographic data, smoking, co- morbidities, family history and pathology were enumerated in this table. Table 1.

Table 1: Distribution of the studied cases according to year, demographic data, smoking, co- morbidities, family history and pathology

		N=340
Year	2015	78(22.9%)
	2016	67(19.7%)
	2017	71(20.9%)
	2018	59(17.4%)
	2019	65(19.1%)
Sex	Male	161(47.4%)
	Female	179(52.6%)
Residence	Kafr Elsheikh	43(12.6%)
	ElGharbia	256(75.3%)
	ElMenofia	20(5.9%)
	Dakahlia	9(2.6%)
	Elbehira	12(3.5%)
Age (years)		47.55 ± 14.89
16 - 19		19(5.6%)
20 - 39		90(26.5%)
40 - 64		181(53.2%)
>65		50(14.7%)
Smoking		90(26.5%)
Co-morbidities	Diabetes	61(35%)
	Hypertension	106(60%)
	Hepatitis c virus	2(1%)
	Cardiac	6(3.4%)
	Epilepsy	1(0.6%)
Family History		74(21.8%)
Pathology	Pituitary adenoma	5(1.6%)
	Anaplastic Astrocytoma	10(3%)
	Atypical meningioma	39(11.6%)
	Central neuroctoma	2(0.6%)
	Classic ependymoma	4(1.3%)
	Craniopharyngioma	3(1%)
	Diffuse astrocytoma	25(7.5%)
	Glioblastoma	173(50.1%)
	Haemangioblastoma	1(0.3%)
	Low grade glioma	6(1.9%)
	Malignant meningioma	3(1%)
	Maxopapillary ependymoma	3(1%)
	Meningeal hemangiopricytoma	2(0.6%)
	Meningiothelial meningioma	17(4.2%)
	Nodular medulloblastoma	9(3%)
	Oligodendroglioma	7(2%)
	Pilocytic astrocytoma	14(4%)
	Pineoblastoma	1(0.3%)
	Subependymal gaint cell astrocytoma	1(0.3%)
	Transitional meningioma	8(2.5%)
	Vestibular schawanoma	6(1.9%)
	Xanthoastrocytoma	1(0.3%)

Data are presented as mean ± SD or frequency (%)

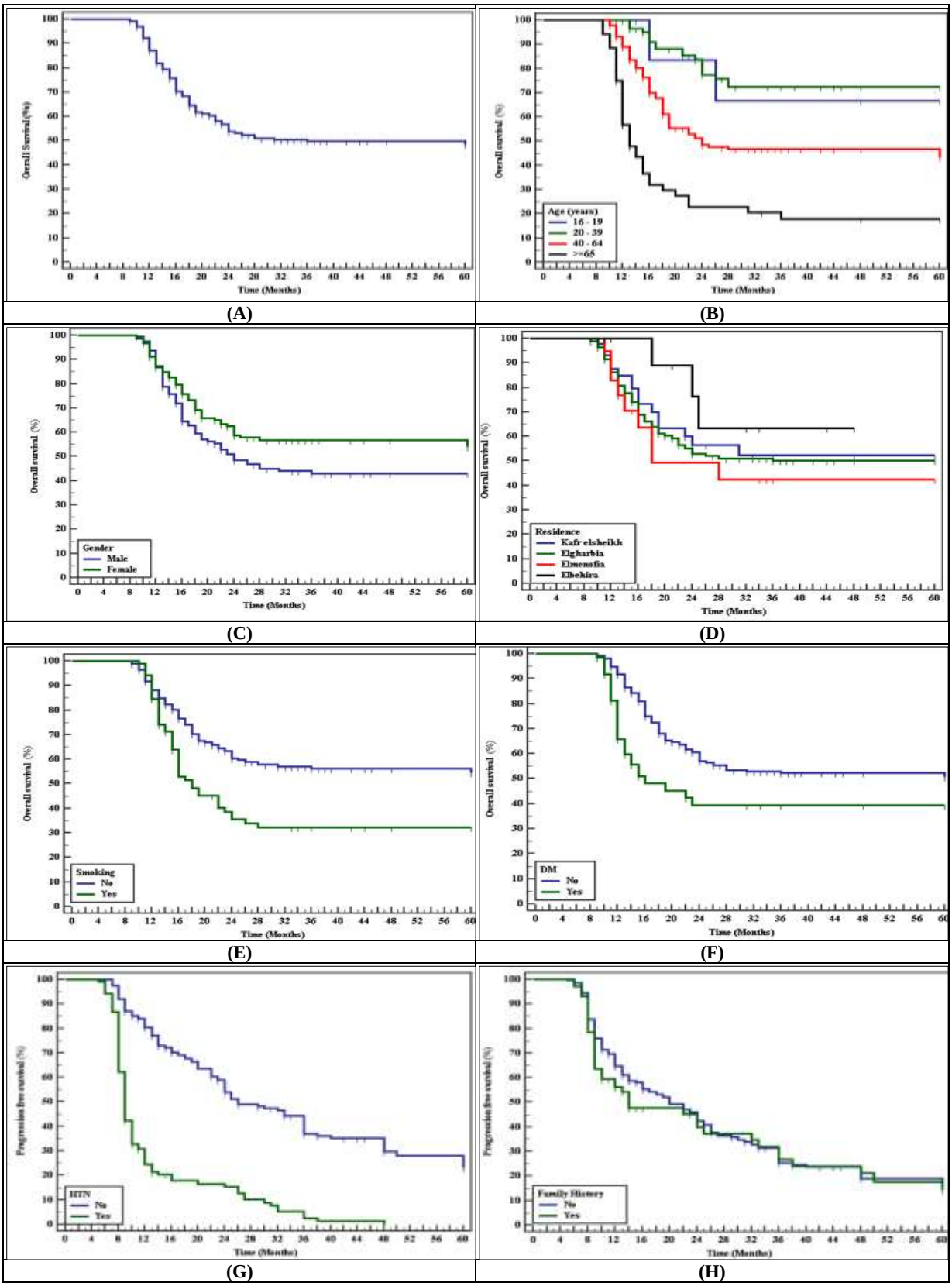
According to grading, 185(54.4%) patients had grade 4 at presentation followed by 86(25.3%) grade 2 and 56(16.5%) grade 1. Frontal lobe (26%) is the most common site followed by temporal, tempro-parietal lobes with 18%, 8.8% respectively. 167 patients had subtotal resection and 118 patients had gross total resection. 185 of patients received concomitant chemoradiation. Regarding type of treatment, 185 of patients received concomitant chemoradiation, 126 patients received radiotherapy alone and only 29 patients followed up post gross total resection. Off all included patients 44% progressed, 21% partially regressed and 18% recurrence cases. 56% of included patients did not receive second line treatment, 9% received (Temodal), 9% (carboplatin, etoposide) and 6.8% (Avastin, Temodal). Table 2.

Table 2: Distribution of the studied cases according to grade, site, type of resection, type of treatment, treatment outcome and second line treatment

		N=340
Grade	Grade 1	56(16.5%)
	Grade 2	86(25.3%)
	Grade 3	13(3.8%)
	Grade 4	185(54.4%)
Site	Cerebellum	14(4%)
	Frontal lobe	88(26%)
	Fronto-parietal	12(3.5%)
	Fronto-temporal	8(2.3%)
	Occiptal lobe	9(2.6%)
	Parietal lobe	11(3.2%)
	Parieto-occiptal	13(4%)
	Sellar lesion	9(2.6%)
	Sphenoid wing	13(4%)
	Spine cord	10(2.9%)
	Temporal lobe	61(18%)
	Tempro-parietal	30(8.8%)
	Ventricles	8(2.3%)
	Anterior portion pituitary	5(1.4%)
	Bi frontal	4(1.2%)
	Brain stem	6(1.8%)
	Cauda equina	3(0.9%)
	Cavernous sinus	4(1.2%)
	Cerebellopontine angle	8(2.3%)
	Corpus callosum	5(1.4%)
	Cranial nerves	9(2.6%)
	Fronto-tempro-parietal	3(0.9%)
	Mid brain	2(0.6%)
	Pinealbody	2(0.6%)
	Tempro- parieto- occiptal	3(0.9%)
Type of resection	No resection (Magnetic resonance spectroscopy)	47(13.8%)
	Subtotal resection	167(49.1%)
	Gross total resection	118(34.7%)
	Biopsy	8(2.4%)
Type of treatment	No treatment (follow up post gross total resection)	29(8.5%)
	Concomitant chemoradiation followed by adjuvant chemotherapy	n = 185
	Temodal + 60GY/30F + Temodal (adjuvant)	179(53.4%)
	Vincrestine + craniospinal radiation + Vincrestine, cisplatin, endoxan (adjuvant)	6(1.7%)
	Radiotherapy alone (50.4-54 Gy)	126(37%)
Treatment outcome	Partially regressed	71(21%)
	Progressed	149(44%)
	Stationary	59(17%)
	recurrence	61(18%)
Second line treatment	No	191(56%)
	Avastin, cyclophosphamide	10(2.9%)
	Avastin, irrenotecan	21(6.2%)
	Avastin, temodal	23(6.8%)
	Carboplatin, vincrestine	10(2.9%)
	Carboplatin, vp16	31(9.1%)
	Carboplatin single agent	7(2.1%)
	Second surgical resection	14(4.1%)
	Hormonal treatment	3(0.9%)
	Temodal	30(9%)

Data are presented as frequency (%)

Estimated median overall survival of CNS tumors patients which was 36 months, also 5-year OS was reported in 48.5% of these patients. As regard parameters that significantly affect overall survival were age, smoking, hypertension, grades and pathology (p<0.001). In addition to p value for diabetes was 0.001 and frontal lobe was 0.003 which also significantly affected overall survival. Figure 1, Table 3.



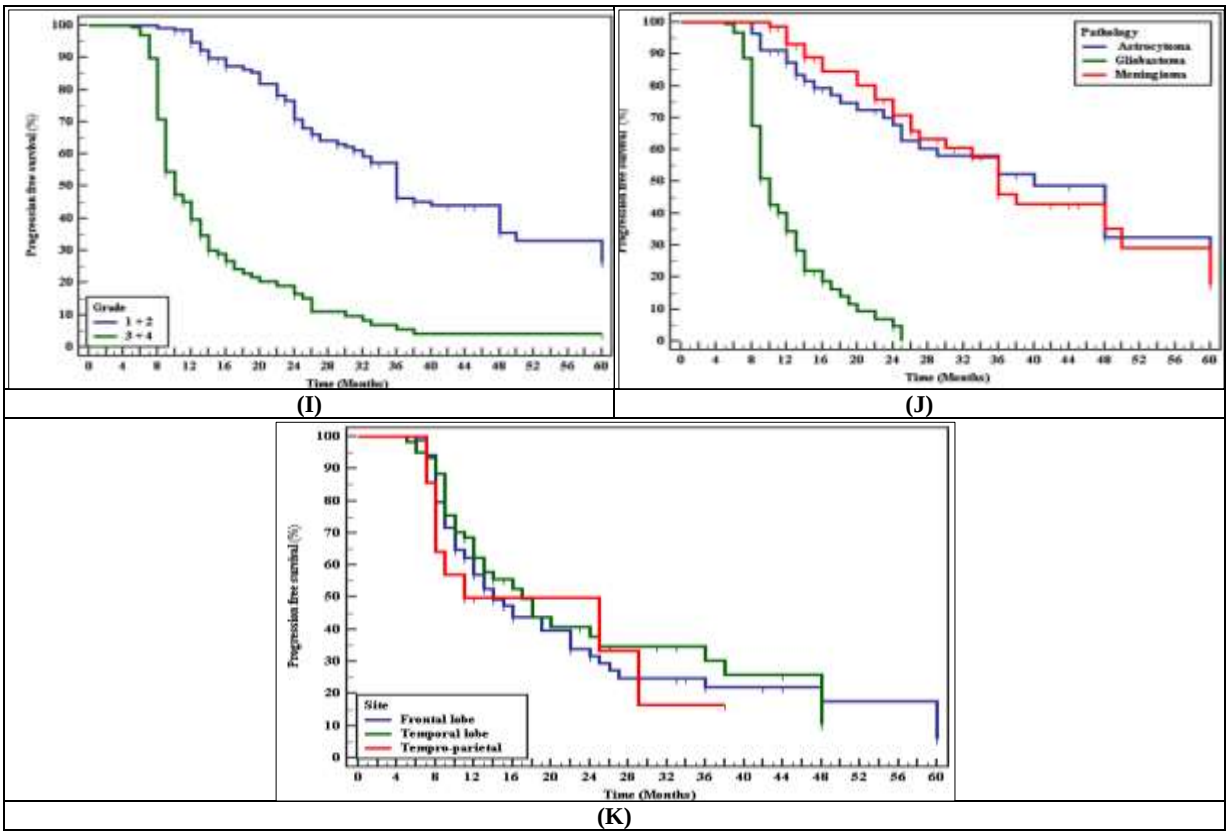


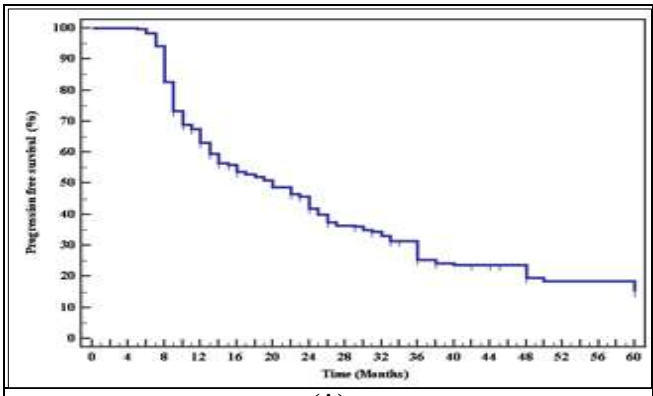
Fig 1: Kaplan-Meier survival curve for (A) Overall Survival, (B) age, (C) sex, (D) residence, (E) smoking, (F) diabetes mellitus, (G) hypertension, (H) family History, (I) grade, (J) pathology and (K)site

Table 3: Univariate analyses of patient's characteristics and overall survival

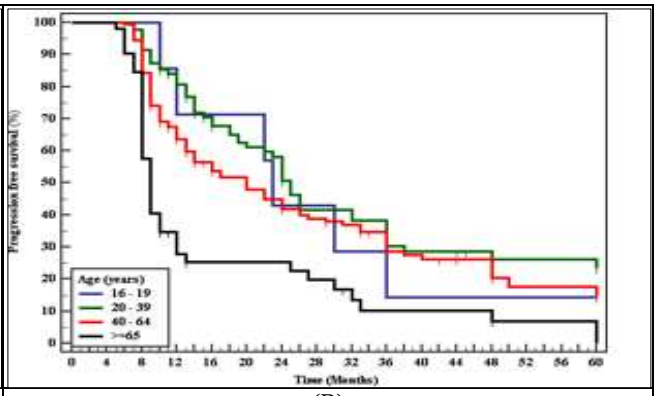
		3m	6m	9m	12m	24m	48m	60m	Mean (95% C.I)	SE.	Log-rank	p
Age	16 - 19	100	100	100	100	83.3	66.7	66.7	47.0 (32.11 - 61.89)	7.598	66.360*	<0.001*
	20 - 39	100	100	100	100	77.5	72.4	72.4	49.10 (44.88 - 53.32)	2.152		
	40 - 64	100	100	100	88.9	48.6	46.8	43.2	36.80 (33.02 - 40.58)	1.928		
	>65	100	100	94.2	56.8	22.9	18.0	18.0	22.62 (17.31 - 27.93)	2.708		
Sex	Male	100	100	98.8	86.8	48.5	43.0	43.0	35.41 (31.61 - 39.20)	1.935	3.688	0.055
	Female	100	100	99.4	87.4	58.8	56.9	53.9	41.15 (37.39 - 44.90)	1.916		
Residence	Kafr elsheikh	100	100	100	87.7	56.5	52.5	52.5	39.75(32.34 - 47.16)	3.781	1.982	0.576
	Elgharbia	100	100	98.8	86.3	52.8	50.2	50.2	38.19 (35.07 - 41.31)	1.592		
	Elmenofia	100	100	100	82.9	49.4	42.3	42.3	34.71 (23.65 - 45.78)	5.645		
	Elbehira	100	100	100	100	76.2	63.5	63.5	38.70 (30.23 - 47.17)	1.393		
Smoking	No	100	100	98.8	88.1	60.3	56.3	54.5	41.19 (38.09 - 44.29)	1.581	12.579*	<0.001*
	Yes	100	100	100	84.4	36.0	32.3	32.3	30.25 (25.28 - 35.21)	2.534		
DM	No	100	100	99.3	91.6	56.9	52.3	50.6	39.73 (36.81 - 42.65)	1.488	11.654*	0.001*
	Yes	100	100	98.4	65.8	39.4	39.4	39.4	31.84 (25.17 - 38.52)	3.404		
HTN	No	100	100	100	93.6	67.1	62.5	62.5	44.14 (41.08 - 47.20)	1.561	55.230*	<0.001*
	Yes	100	100	97.2	73.3	23.5	21.4	17.1	25.15 (20.90 - 29.41)	2.169		
Family history	No	100	100	99.6	87.6	55.5	51.3	49.5	39.12 (36.14 - 42.10)	1.520	1.651	0.199
	Yes	100	100	97.3	85.3	47.6	44.9	44.9	35.16 (28.93 - 41.39)	3.178		
Grade	Grade 1 + 2	100	100	100	100	98.2	96.0	92.4	58.66 (57.20 - 60.11)	0.742	190.586*	<0.001*
	Grade 3 + 4	100	100	98.5	77.8	15.8	10.5	10.5	21.05 (18.61 - 23.48)	1.242		
Pathology	Astrocytoma	100	100	100	98.2	93.1	84.4	84.4	54.60 (50.59 - 58.61)	2.046	188.682*	<0.001*
	Gliobastoma	100	100	98.3	76.5	4.4	0.0	0.0	16.46 (15.67 - 17.24)	0.402		
	Meningioma	100	100	100	96.9	95.0	92.2	82.0	56.76 (53.32 - 60.20)	1.754		
Site	Frontal lobe	100	100	100	83.1	38.2	32.0	32.0	31.091 (25.99- 36.19)	2.600	8.628*	0.003*
	Temporal lobe	100	100	96.7	84.3	47.0	36.1	36.1	32.893 (26.66- 39.13)	3.182	3.046	0.081
	Tempro-parietal	100	100	100	91.5	32.8	32.8	32.8	26.990 (19.17- 34.81)	3.991	1.023	0.312

* Significant p value <0.05. DM: diabetes mellitus, HTN: hypertension

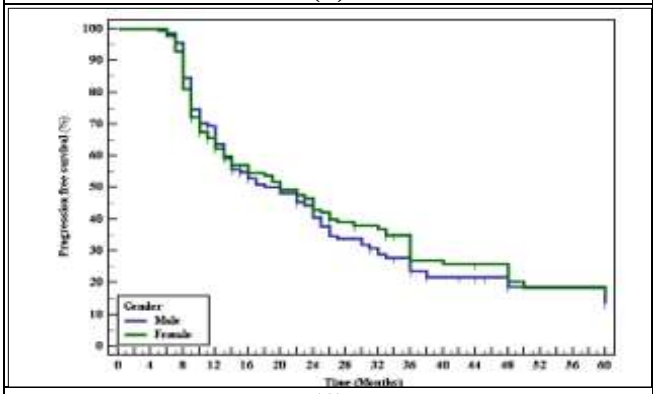
Estimated median PFS for CNS tumors patients which was 20 months and about 15.2% of these patients had 5-year PFS. The main parameters (age, pathology and grade) that affect progression free survival of CNS tumors which were statistically significant with P value (<0.001). Also, the comorbidities (HTN, DM) were significantly affect progression free survival (p<0.05). Table 4, Figure 2.


Progression free survival (%)
Time (Months)

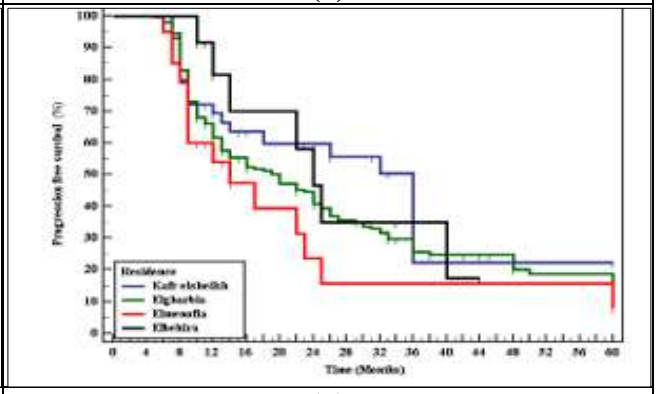
(A)


Progression free survival (%)
Age (years)
16 - 19
20 - 39
40 - 64
>=65
Time (Months)

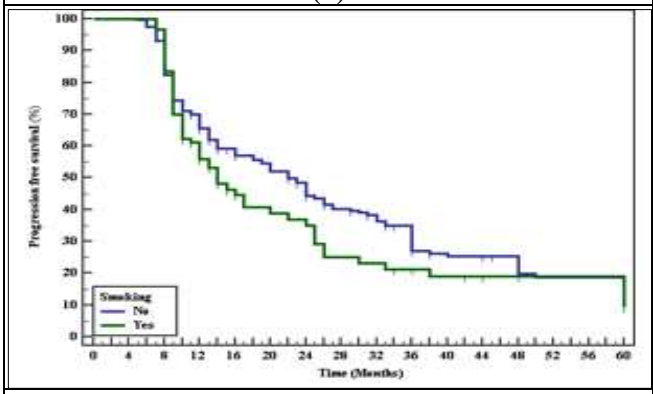
(B)


Progression free survival (%)
Gender
Male
Female
Time (Months)

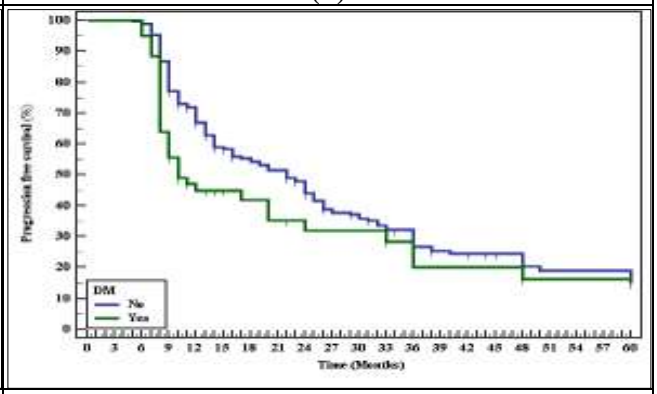
(C)


Progression free survival (%)
Time (Months)

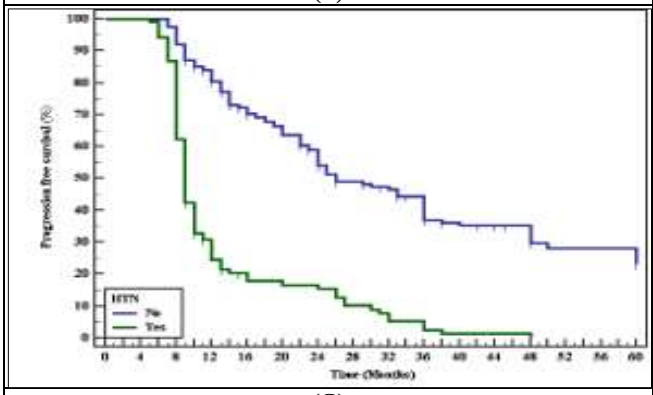
(D)


Progression free survival (%)
Smoking
No
Yes
Time (Months)

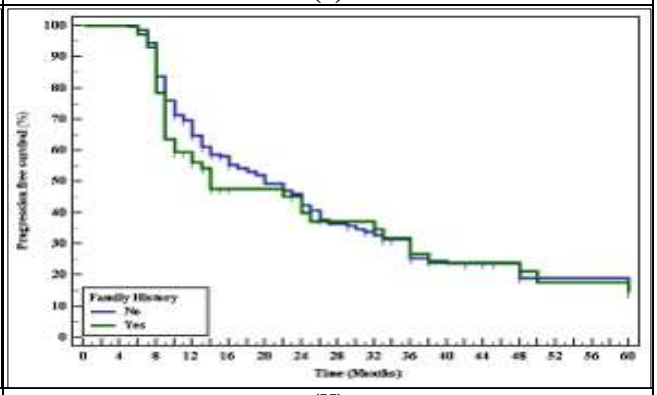
(E)


Progression free survival (%)
DM
No
Yes
Time (Months)

(F)


Progression free survival (%)
HTN
No
Yes
Time (Months)

(G)


Progression free survival (%)
Family History
No
Yes
Time (Months)

(H)

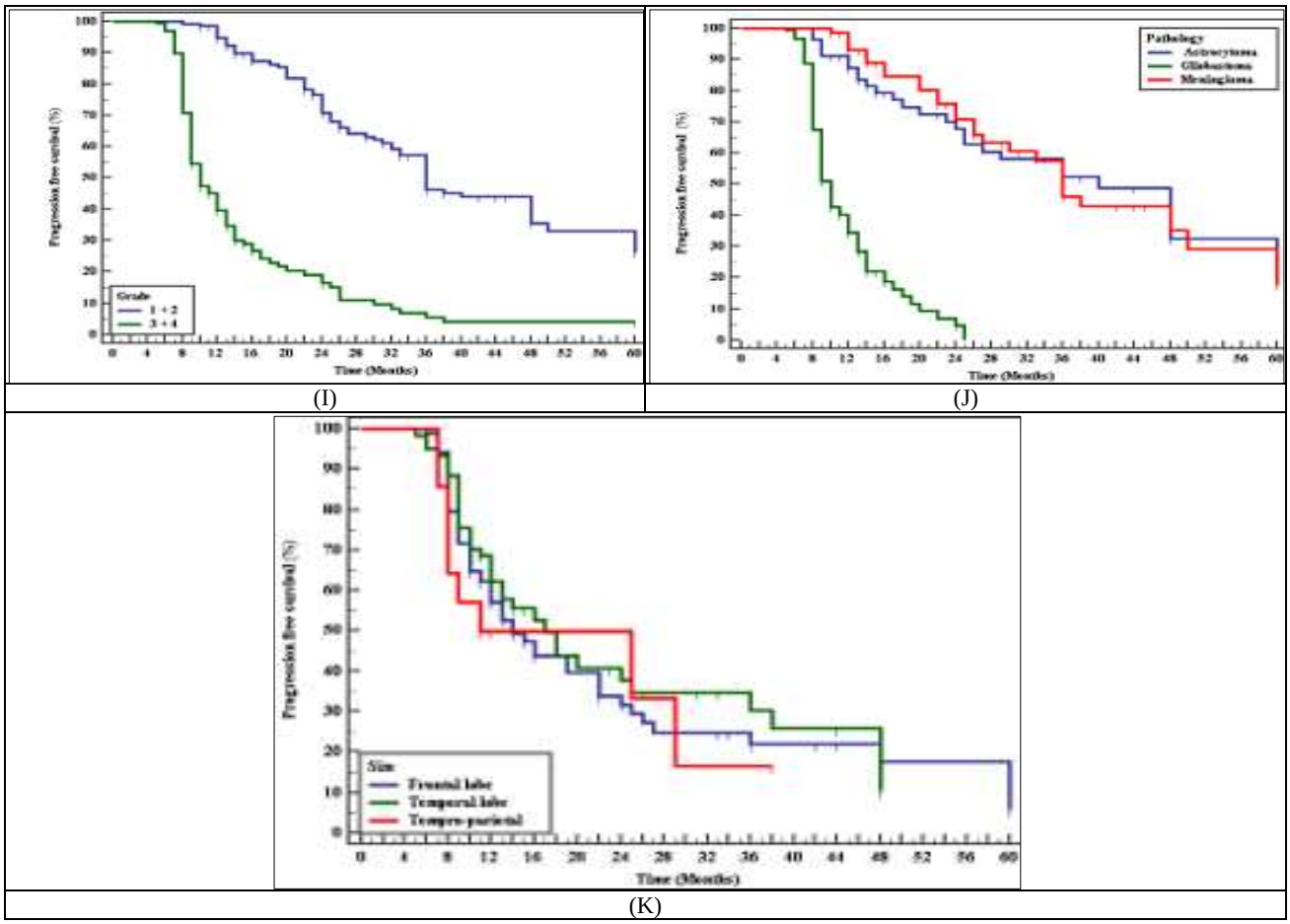


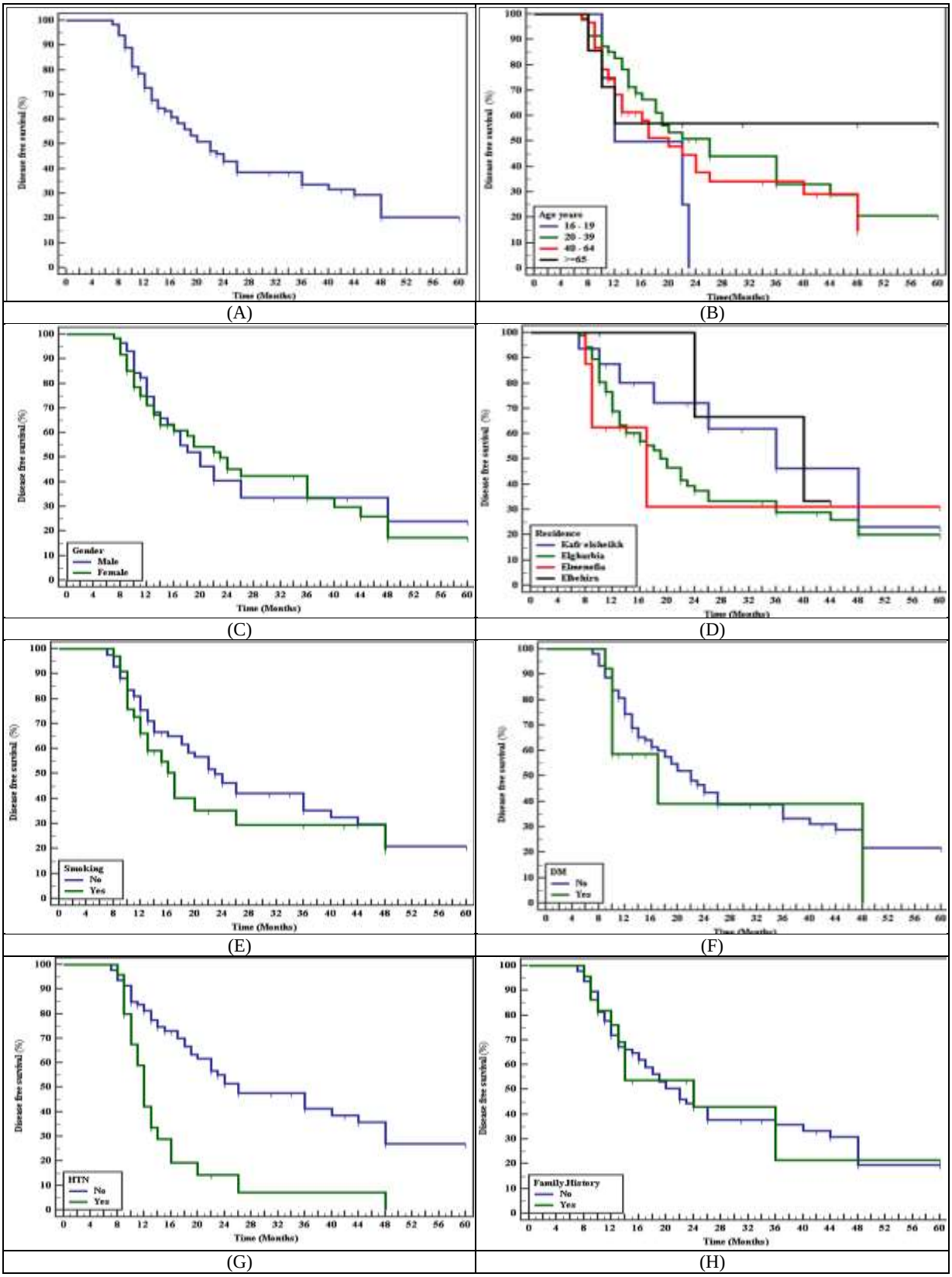
Fig 2: Kaplan-Meier survival curve for (A) progression free survival, B) age, (C) sex, (D) residence, (E) smoking, (F) diabetes mellitus, (G) hypertension, (H) family History, (I) grade, (J) pathology and (K) site

Table 4: Univariate analyses of patient's characteristics and progression free survival

		3m	6m	9m	12m	24m	48m	60m	Mean (95% C.I)	SE.	Log rank	P
Age	16 - 19	100	100	100	71.4	42.9	14.3	14.3	27.57 (15.92 - 39.22)	5.945	34.216*	<0.001*
	20 - 39	100	100	87.4	80.6	50.8	26.2	23.3	31.10 (26.66 - 35.55)	2.269		
	40 - 64	100	99.5	74.2	63.5	42.0	20.4	14.6	27.14 (23.74 - 30.54)	1.734		
	>65	100	90.4	40.4	27.7	25.4	6.8	0.0	16.58 (11.99 - 21.17)	2.342		
Sex	Male	100	99.4	74.5	63.7	40.6	18.7	13.4	25.96 (22.59 - 29.34)	1.721	0.113	0.737
	Female	100	97.8	72.1	62.3	43.0	20.4	16.7	27.21 (23.85 - 30.56)	1.710		
Residence	Kafr elsheikh	100	100	72.1	69.3	59.8	22.4	22.4	30.30 (23.41 - 37.20)	3.520	3.846	0.279
	Elgharbia	100	98.0	73.0	61.6	40.8	20.2	15.5	26.38 (23.62 - 29.13)	1.407		
	Elmenofia	100	95.0	60.0	54.0	23.6	15.8	7.9	21.17 (11.85 - 30.48)	4.752		
	Elbehira	100	100	100	81.5	46.6	17.5	17.5	26.62 (18.68 - 34.55)	4.048		
Smoking	No	100	97.6	74.4	65.6	44.2	19.9	16.2	27.64 (24.88 - 30.40)	1.408	2.598	0.107
	Yes	100	100	83.3	55.9	34.9	19.0	9.5	23.53 (18.85 - 28.21)	2.387		
DM	No	100	98.9	77.1	66.9	44.0	20.3	14.9	27.38(24.78 - 29.98)	1.328	5.253*	0.022*
	Yes	100	95.1	55.7	45.0	31.8	16.2	16.2	23.0 (17.21 - 28.78)	2.953		
HTN	No	100	100	87.2	80.5	54.0	29.9	23.2	33.12 (30.05 - 36.19)	1.569	121.970*	<0.001*
	Yes	100	94.3	42.5	24.7	15.3	0.0	0.0	13.03 (11.22 - 14.83)	0.921		
Family History	No	100	99.6	75.9	64.9	42.5	19.1	15.9	26.87 (24.21 - 29.54)	1.359	0.650	0.420
	Yes	100	97.3	63.5	56.2	39.9	21.3	14.2	25.79 (20.45 - 31.12)	2.721		
Grade	Grade 1 + 2	100	100	99.3	94.7	70.9	35.5	26.0	39.16 (35.80 - 42.51)	1.710	128.578*	<0.001*
	Grade 3 + 4	100	97.0	54.5	39.6	16.5	4.1	4.1	15.38 (13.17 - 17.59)	1.127		
Pathology	Astrocytoma	100	100	91.1	87.3	67.7	32.5	21.7	38.04 (32.27 - 43.81)	2.945	183.946*	<0.001*
	Gliobastoma	100	96.6	50.9	34.4	4.7	0.0	0.0	11.90 (10.98 - 12.83)	0.471		
	Meningioma	100	100	100	93.2	70.9	35.2	17.6	38.49 (33.12 - 43.85)	2.737		
Site	Frontal lobe	100	98.9	71.6	57.1	31.7	17.7	5.9	23.859 (18.96-28.76)	2.498	2.953	0.086
	Temporal lobe	100	95.1	75.4	62.4	37.8	10.4	10.4	24.134 (19.26-29.0)	2.487	0.117	0.733
	Tempro-parietal	100	100	58.3	46.8	39.0	9.7	9.7	18.119 (12.70-23.54)	2.763	3.610	0.057

* Significant p value <0.05. DM: diabetes mellitus, HTN: hypertension.

Estimated median DFS of CNS tumors patients which was 22 months, and 20.4% of these patients had 5-year DFS the main parameters (HTN, pathology and grade) that affect DFS of CNS tumors patients which were statistically significant (p<0.001). Figure 3, Table 5.



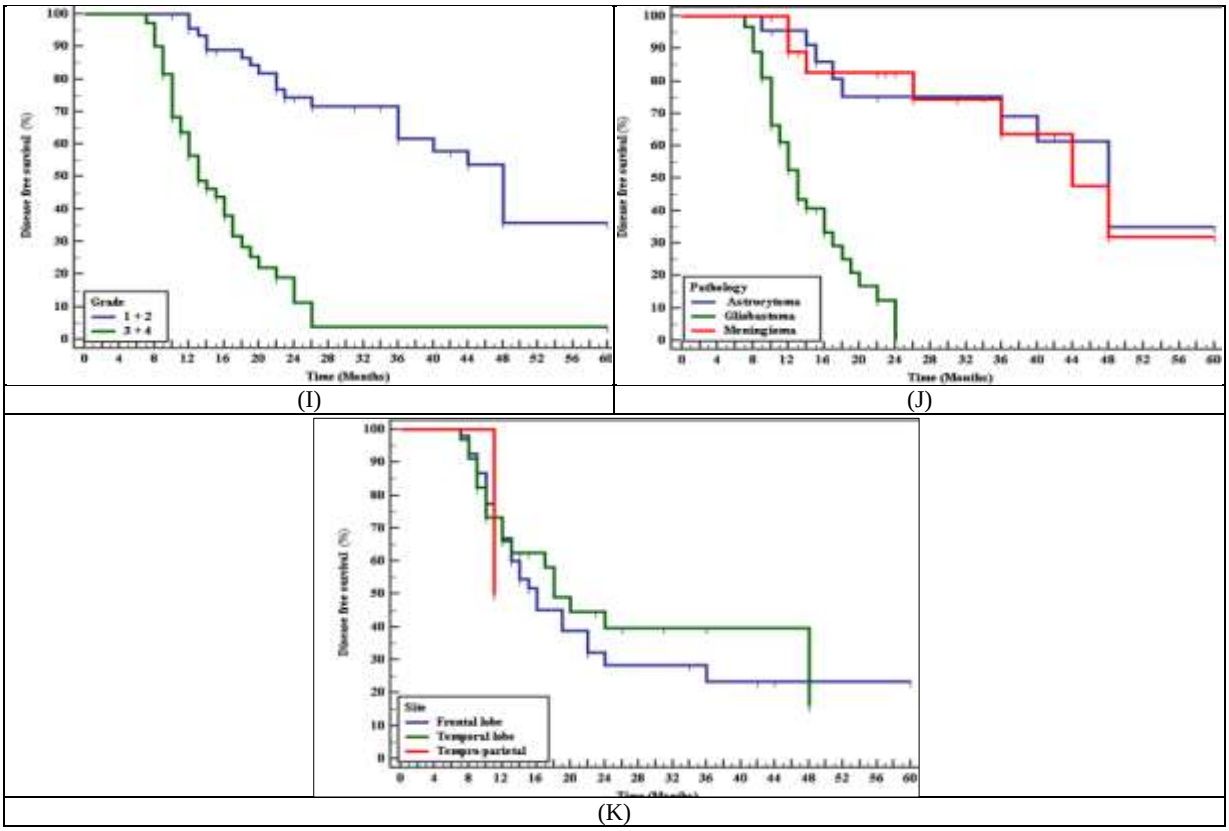


Fig 3: Kaplan-Meier survival curve for (A) disease free survival, (B) age, (C) sex, (D) residence, (E) smoking, (F) diabetes mellitus, (G) hypertension, (H) family History, (I) grade, (J) pathology and (K) site

Table 5: Univariate analyses of patient's characteristics and disease-free survival

		3m	6m	9m	12m	24m	48m	60m	Mean (95% C.I)	SE.	Log rank	P
Age	16 - 19	100	100	100	50.0	-	-	-	16.750 (10.18- 23.32)	3.351	3.932	0.269
	16 - 19	100	100	91.5	82.8	51.0	20.7	20.7	30.859 (24.83-36.89)	3.076		
	40 - 64	100	100	86.7	68.2	37.7	14.7	-	25.730 (20.64-30.82)	2.597		
	>65	100	100	85.7	57.1	57.1	57.1	57.1	38.571 (20.22-56.92)	9.361		
Sex	Male	100	100	93.0	74.6	40.4	24.1	24.1	29.301 (22.97-35.64)	3.232	0.052	0.819
	Female	100	100	91.8	71.0	45.2	17.3	17.3	29.186 (23.77-34.60)	2.763		
Residence	Kafr Elsheikh	100	100	93.8	87.5	72.2	23.2	23.2	36.764 (25.86-47.67)	5.563	3.064	0.382
	Elgharbia	100	100	89.7	68.8	37.5	20.2	20.2	27.698 (22.91-32.49)	2.443		
	Elmenofia	100	100	62.5	62.5	31.3	31.3	31.3	27.313 (6.17-48.46)	10.787		
	Elbehira	100	100	100	100	66.7	33.3	33.3	36.0 (26.22-45.78)	4.989		
Smoking	No	100	100	88.2	75.4	46.2	20.8	20.8	30.420 (25.63-35.21)	2.442	0.944	0.331
	Yes	100	100	90.9	66.1	35.2	19.6	19.6	24.046 (17.52-30.57)	3.329		
DM	No	100	100	88.6	74.4	43.7	21.7	21.7	29.603 (25.27-33.93)	2.209	0.596	0.440
	Yes	100	100	92.3	58.7	39.2	0.0	-	26.175 (12.76-39.59)	6.846		
HTN	No	100	100	91.4	81.3	51.6	26.9	26.9	33.336 (28.52-38.15)	2.456	22.168*	<0.001*
	Yes	100	100	80.0	42.1	14.4	0.0	-	15.583 (11.08-20.08)	2.295		
Family history	No	100	100	89.6	72.0	42.9	19.6	19.6	29.296 (24.82-33.77)	2.284	0.0	0.996
	Yes	100	100	86.4	76.0	43.0	21.5	21.5	28.59 (18.27-38.91)	5.264		
Grade	Grade 1 + 2	100	100	100	95.7	74.4	35.9	35.9	42.187 (36.73-47.65)	2.786	43.157*	<0.001*
	Grade 3 + 4	100	100	81.4	56.4	11.4	3.8	3.8	16.526 (13.21-19.85)	1.695		
Pathology	Astrocytoma	100	100	95.7	95.7	75.3	35.1	35.1	42.645 (34.60-50.69)	4.103	51.984*	<0.001*
	Gliobastoma	100	100	81.0	52.7	0.0	-	-	14.391 (12.85-15.93)	0.787		
	Meningioma	100	100	100	88.9	82.5	31.8	31.8	41.936 (32.69-51.18)	4.716		
Site	Frontal lobe	100	100	86.8	66.9	28.3	23.5	23.5	25.819 (19.22- 32.42)	3.369	2.907	0.088
	Temporal lobe	100	100	82.4	66.2	39.7	15.9	15.9	27.217 (20.49-33.94)	3.432	0.148	0.700
	Tempro-parietal	100	100	100	-	-	-	-	11.0 (11.0 - 11.0)	0.0	0.649	0.421

* Significant p value <0.05. DM: diabetes mellitus, HTN: hypertension.

Discussion

Malignant and non-malignant brain and other CNS tumors comprise a diverse constellation of over 100 histologically distinct subtypes with varying descriptive epidemiology, clinical characteristics, treatments, and outcomes [5].

Regarding histopathological classification, our study showed that the most commonly occurring malignant brain and other CNS histopathology was glioblastoma of all tumors. This matched with previously mentioned study

Miller *et al*. [6] found the most commonly occurring malignant brain and other CNS tumor was glioblastoma.

As regard treatment, our study revealed that high grade glioma treated with surgery followed by radiation with dose 60Gy/30 fractions and oral alkylating agent temozolamide with a daily therapeutic dose of 75 mg/m^2 concurrent to RT and then with a daily dose of 150 to 200 mg/m^2 for five days of every 28-day cycle during 6 cycles. That standard treatment since 2005 [8]. In addition, our study found that low grade glioma was treated with surgery followed by follow-up or adjuvant radiotherapy based on grade and resection with a dose of 50.4-54 Gy at 1.8 Gy per fraction. Byrne *et al*. [9] conducted using hospital-reviewed data from the national cancer database (NCDB) from over 1500 centres in the United States diagnosed between 2004 and 2014.

As regards progressive or recurrent disease, despite initial resection and multimodality therapy, over 44% of patients showed disease progression within one year of diagnosis, particularly those with high grade tumours. rechallenged with TMZ 15.5% (53/340 patients) and other agents such as carboplatin (Paraplatin)11% (38/340 patients), etoposide (Toposar) 9% (31/340 patients), irinotecan (Camptosar) 6% (21/340 patients), and Bevacizumab (Avastin) 15.8% (54/340 patients), and that treatment approach matched with Chen *et al*. [10] meta-analysis study, based on 42 studies involved 5236 participants aimed to show treatment options for progression or recurrence of glioblastoma, which rechallenged with temozolomide, Lomustine (also known as CCNU). PCV (Procarbazine, lomustine, vincristine) and bevacizumab (avastin) as mononrherapy or combination irrenotecan.

As regards overall survival, in our study we found that five-year overall survival of CNS tumors was 48%. That is superior legler *et al*. [12] showed that the five-year overall survival ranged from 48% to 55% for young adult (ages 15-44 years), 12% to 16% for middle-aged adults (ages 45-64 years), and 4% to 5% for elderly (≥65 years old). But in Allemani *et al*. [13] Global surveillance of trends in cancer survival: study of individual records from 322 population-based registries in 71 countries for 37,513,025 patients diagnosed with one of 18 malignancies between 2000 and 2014.

Regarding grade-related five-year overall survival, in our study we revealed that grade 1,2 five- year survival was 92%, which was comparable to the majority of other studies published in the previous ten years such as Gittleman *et al*. [14] aimed to analyze incidence and survival of CNS tumours between 2012 and 2016 based on data provided by CBTRUS which showed five year overall survival of grade 1, 2 was 91.5%.

Regarding grade 3, 4 our results showed that two- year survival was 15.8% and that matched with Michael *et al*. [15] aimed to show Longer- term (≥ 2 years) survival in patients with glioblastoma in population-based studies pre- and post-2005. It assessed if ≥ two-year survival has changed in relation to the trial of radiotherapy plus concomitant and adjuvant temozolomide published in 2005. Demonstrated that two-year survival was 11%.

Regarding histopathological type -related five-year overall survival, in our study we showed that one- and two-year survival of glioblastoma was 76.5%, 4.4% respectively. This is superior Mohammed *et al*. [16] revealed that one-year overall survival was 30. In contrast to Bjorland *et al*. [17] showed that one- and two-year survival was 41.3%, 17.3% respectively.

Our study found that the five-year overall survival rate for all meningiomas was 82%. That matched with Holleczek *et al*. [18] revealed that the five-year overall survival rate for meningioma was 85%.

In our study we found that five-year overall survival of astrocytoma was 84%. In Kandil *et al*. [19] showed that five-year overall survival was 69%. In contrast, Zhang *et al*. [20] found that 5-year overall survival ranged from 61% to 76%.

Regarding progression free survival, in our study we found five-year PFS of astrocytoma was 21%. Contrary to Yan *et al*. [21] found that five-year PFS of astrocytoma was 44%.

In our study we found PFS of Glioblastoma at 1 year 34%. In contrast, the Filippini *et al*. [22] found that PFS at 1 year was 15%.

Our results showed that meningioma PFS at two, five years was 70.9%, 17.6% respectively. In contrast to Kent *et al*. [23] another cohort retrospective study that analyzed histologically confirmed meningiomas at Department of Radiation Oncology, Duke University Medical Centre, Durham, North Carolina between January 1992 and March 2017 with PFS at two five years was 65%, 38% respectively.

As regards DFS, our study found that meningioma one- and five-year disease-free survival rates were 88.9% and 31.8%, respectively. In our study we found that Glioblastoma one-year DFS rate was 34.4%. In contrast, Brown *et al*. [24] found that one-year DFS rate of Glioblastoma was 51%.

In our study we revealed that the five-year disease-free survival rate for astrocytoma patients was 35.1%. That matched with Chaulagain *et al*. [25] found the five-year disease-free survival of astrocytoma was 37%.

Limitations of this study including that the sample size was relatively small. The study was in a single center.

Conclusion

Glioblastoma is the most common pathological type with 50% followed by atypical meningioma with 11.6% and diffuse astrocytoma with 7.5%. 54% of included patients had grade 4 followed by grade 2&1 (25% & 16% respectively). Frontal lobe (26%) is the most common site followed by temporal, tempro-parietal lobes with 18%, 8.8% respectively. According to treatment outcome, 44% progressed, 21% partially regressed and 18% recurrence cases. The estimated median overall survival of CNS tumors patients which was 36 months, also 5-year OS was reported in 48.5% of the patients. The estimated median PFS for CNS tumors patients was 20 months and about 15.2% of these patients had 5-year PFS. The estimated median DFS of CNS tumors patients which was 22 months, and 20.4% of these patients had 5-year DFS.

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