Original Article

The Neuro-Ophthalmic Features Corresponding with Brain Tumors

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Abstract

Background: *Brain tumor causes several features due to mass effect, irritation, raised intracranial pressure and influence of hormones. The visual pathway and ocular nerves also affected and exerts some neuro-ophthalmic features which might indicate the progress and prognosis of the disease.*

Objectives: *To observe the presentation of neuro-ophthalmic features of brain tumors.*

Materials and Methods: *This cross sectional study was conducted at the department of Ophthalmology and Neurosurgery at Dhaka Medical College and Hospital for twelve months. A total of 100 patients with newly diagnosed brain tumor either by computerized tomography (CT) or magnetic resonance imaging (MRI) were included in this study according to inclusion and exclusion criteria.*

Results: *Mean age of the studied patients was 44.64±10.6 (SD) years. Male 60% and female 40% . Impaired visual acuity was observed in 68% of patients where 19% were blind. Common ocular symptoms were blurring of vision (82%) and impaired color vision (45%) and common neuro-ophthalmic features were headache (84%) papilloedema (48%), optic atrophy (43%), relative afferent pupillary defect (42%), ocular nerve palsy (27%), diplopia (15%), ptosis (4%), and proptosis(6%). The prime location of the tumors were frontal lobe (22%), parietal lobe (21%) and temporal region (19%). The lesions were glioma (29%), meningioma (25%), secondary brain tumor (23%), pituitaryadenoma (7%), craniopharyngioma (5%), vestibular schwannoma (3%), haemangioblastoma (2%), choroid plexus tumor (2%), medullablastoma (2%) and thalamic tumor (2%).*

Conclusion: *In this study significant numbers of patients were visually impaired at presentation.*

Key words: *Neuro-Ophthalmic Features, Brain Tumors.*

Date of received: *11.11.2024*

Date of acceptance: *26.02.2025*

DOI: https://doi.org/10.3329/kyamcj.v16i01.74323

KYAMC Journal. 2025; 16(01): 20-23.

Introduction

Brain tumors make up about 5% of all tumors of human body.They are a tremendous public health concern worldwide due to their high prevalence, lifelong disability rate and mortality rate.[1] Globally its incidence and mortality rate is reported 3.4 and 2.5 per 100,000 people.[2] In 2016 the number of new brain tumor cases in Bangladesh was 2510, and 2008 person faced death.

The most frequent types of brain tumors are glioma, meningioma, pituitary adenoma and craniopharyngioma and about 20% of them are of chiasmal origin.[3] Primary brain tumors are among the most common reasons to seek neurological and ophthalmological consultation as half of the brain tumors present with ocular symptoms only.[4] Since the visual pathway extends from the frontal lobe anteriorly to the occipital lobe posteriorly any tumor compressing these structures can involve the visual pathway reflected externally.[5] For example a patient with a bitemporal visual field defect suggests having chiasmal compression. At the same time the ocular motor nerve palsy

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implies the lesion at the cavernous sinus. Hence an awareness of the neuro-ophthalmic manifestations relating to intracranial tumors threatening visual pathways calls for a thorough examination to correlate the diagnosis.

Neuro-ophthalmic features of brain tumors usually include loss of vision, change in color vision, proptosis, ptosis, ocular nerve palsy, diplopia, optic disc changes, nystagmus, strabismus, paresis or paralysis of extraocular movements.[6] The location, size and involvement of the visual pathway and ocular nerves determine to the degree of involvement of the eyes in brain tumors.[7] In a retrospective study sign such as vision loss was seen in 88.9%, optic disc abnormality was found in 66.7%, diplopia and 6th cranial nerve palsy were present in 11.1% cases with a brain tumor. Another study suggested blurring of vision is the most common symptom followed by proptosis, loss of visual field and diplopia. The ocular signs were visual field defect, papilloedema, visual acuity 6/36 to no light perception (70.58%), 6/6 to 6/12 (23.52%) & 6/18 to 6/36 (5.58%) and ocular nerve palsy. Visual field defect ranged from non-localizing signs like an enlarged blind spot to localizing signs such as bitemporal hemianopia, homonymous hemianopia etc.[8] Some study even found the most frequently occurring pituitary adenoma commonly presents with a bitemporal pattern of visual field loss which sometimes corresponds with optic nerve or chiasmal compression.[9] Whereas meningioma presents with less commonly ophthalmic features.[10] Patients has shown blindness from the tumor due to delayed medical seeking.[11] So to say brain tumors may present with various neuro-ophthalmic features.

In developing countries like ours expensive investigations like CT / MRI are yet to be widely available. A careful neuro-ophthalmic evaluation can diagnose brain tumors with a fair amount of accuracy. If correlated to clinical symptoms this evaluation can aid in earlier diagnosis, proper management, avoidance of complications, and better outcome.

Materials and Methods

This cross sectional study was conducted at the department of Ophthalmology and Neurosurgery at Dhaka Medical College and Hospital from April 2019 to October 2021.

The selected patients were diagnosed with brain tumors having neuro-ophthalmic features.

In Bangladesh, no such relevant study is available. Considering 50% prevalence of neuro-ophthalmic manifestations of brain tumour, the sample size estimation is done by using following statistical formula.

For this study, sample size was calculated with 95 % confidence interval and 10% error.
For 50% prevalence P=0.5, q= (1-P) and for 95% confidence level Z = 1.96 and for 10% error (d) = .1
n = 0.196(1-P)Z2/(error)2
n = 0.447(1-0.5)1.962/(.1)2
n =96.04
Due to shortage of time and resource constraints, total 100-study population were included for the study.

Results

Majority participants belonged to age group 31-40 years (42%), 41-50years (25%), 51-60 years (18%), 18-30 years (8%) and >60 years (7%). Mean age was 44.64±10.6 (SD) years.

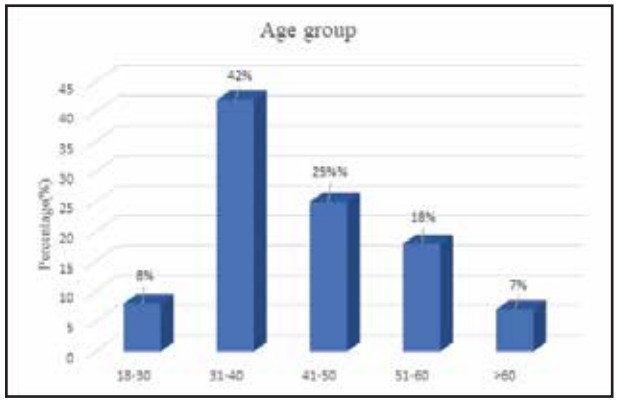

Figure 1: Distribution of respondents by age (n=100)

Majority of the participants were male 60% and 40% were female.

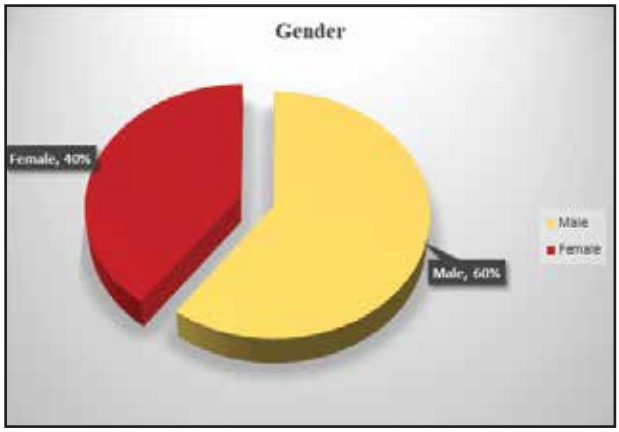

Figure 2: Distribution of respondents by gender (n=100)

Among the participants majority had impaired visual acuity < 6/18–3/60 (68%), blind: visual acuity <3/60 in 19% and 13% had normal visual acuity 6/6–6/18.

Table I: Distribution of participants by visual status (n=100)

Visual status	Frequency (%)
Blind: VA <3/60	19
Impaired: VA < 6/18 –3/60	68
Normal: VA = 6/6 –6/18	13
Total	100

Among the participants majority had enlarged blind spot (42%) following in decreasing order by homonymous hemianopia (18%), quadrantanopia (11%), bitemporal hemianopia (7%) , normal visual field (7%) and others (8%).

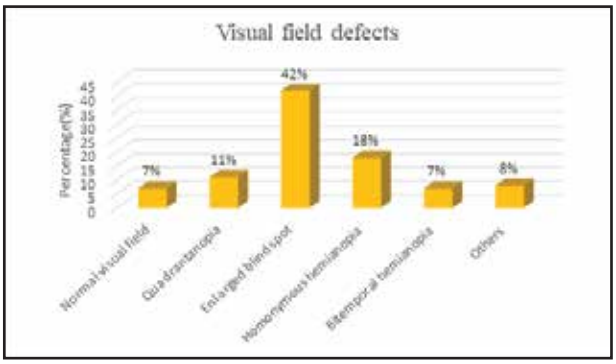

Figure 3: Distribution of respondents by visual field defects (n=100)

In 22% of patients the location of tumor was in frontal lobe, 21% was in parietal region, 19% located in temporal lobe, 13% was in peri-chiasmatic region,11% was in fronto-parietal region, 4% was in fronto-temporal region, 3% was in CP angle tumor, 5% was in occipital region and 2% was in 3rd ventricle.

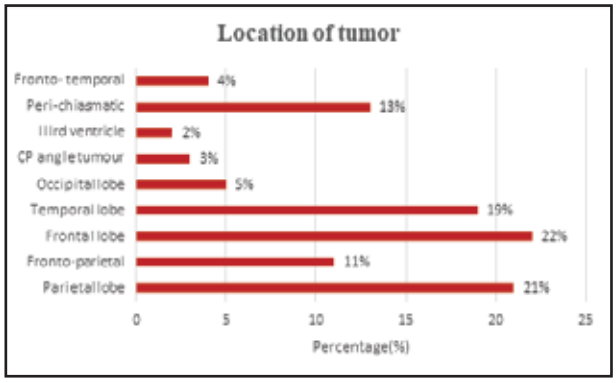

Figure 4: Distribution of participants by location of tumor (n=100)

Table II: Distribution of participants by ocular and neuro-ophthalmic features (n=100).

Ocular features	Frequency (%)
Impairment of vision	82%
Impaired color vision	45%
Neuro -ophthalmic features	
Headache	84%
Papilloedema	42%
optic disc atrophy	43%
Relative afferent pupillary defect	42%
Ocular nerve palsy	27%
Diplopia	13%
Proptosis	6%
Ptosis	4%
Strabismus	2%
Nystagmus	2%

*Multiple responses considered

Discussion

A primary brain tumor is one of the most common and important reasons for seeking neurological and ophthalmological consultation worldwide. The clinical signs and symptoms and management of these tumors depends on the site, type and duration of the tumor. The clinical features are related to mass effect, raised intracranial tension or expression or suppression of various hormones by the tumors or due to hydrocephalus.[12] Ophthalmic signs and symptoms include blurring of vision , ptosis, paresis or paralysis of extraocular movements, diplopia, and optic disc changes. About 46.8%–88.6% of patients present with neuro-ophthalmological manifestations.[13] Neuro-ophthalmic manifestations may help diagnose tumors since the ophthalmologist may be the first point of call for patients with this tumors.[14] This cross-sectional study was conducted at the Department of Ophthalmology and Department of Neurosurgery at Dhaka Medical College and Hospital to see the neuro-ophthalmic features of intracranial tumor. Majority respondents belonged to age group 31-40 years (42%) followed in decreasing order by 41-50years (25%), 51-60 years (18%), 18-30 years (8%) and >60 years (7%). Mean age was 44.64±10.6(SD) years. In Tagoe et al study, the mean age was 42.6 years±16.6 (SD)

patients diagnosed with primary brain tumors which corresponds with the current study.[15] This study showed among the respondent majority had impaired visual status < 6/18–3/60 (68%), blind: visual status <3/60 in 19% and 13% had normal visual status 6/6–6/18. Moreover majority had enlarged blind spot (42%) followed in decreasing order by homonymous hemianopia (18%), quadrantanopia (11%), bitemporal hemianopia (7%), normal visual field (7%) and others (8%).Among the respondents in 22% of patients the location of tumor was in frontal lobe, 21% was in parietal region, 19% located in temporal lobe, 13% was in peri-chiasmatic region,11% was in fronto-parietal region, 4% was in fronto-temporal region, 3% was in Cerebello pontine angle tumor, 5% was in occipital region, and 2% was in 3rd ventricle region.In Deshmukh et al study, the visual acuity was poor in most of the patients at the time of presentation, that is, 6/36 or less in 70.58% of the patients. 23.52% of the patients had a visual acuity of 6/6–6/12, and 5.88% had visual acuity between 6/12 and 6/36 which corresponds with the current study. They also found hemianopia was found to be the most common visual defect, followed by quadrantopia. Their pattern depends on the location of the tumor. In this study among the respondents most common ocular symptoms was blurring of vision (82%) followed in decreasing order by decreased color vison (45%). In neuro-ophthalmic features headache (84%), papilloedema (48%),relative afferent pupillary defect (42%),optic disc atrophy (43%),optic disc swelling (27%), ocular nerve palsy (27%), proptosis (6%), ptosis (4%), strabismus (2%) and nystagmus (2%). Normal optic disc was (18%). In Tagoe et al study the commonest ocular symptom was visual blur (30, 83.3%). Other common complaints were photophobia (11, 31.4%) and ocular pain (11, 31.4%) which corresponds with the current study. In neuro-ophthalmic signs were optic atrophy (26, 74.3%), RAPD (12, 34.3%) and swollen optic discs (9, 25 %).

Conclusion

The average age of the patients with brain tumour was 45 years with male predominance. Impairment of the vision was the most common ocular features. Headache was the most common neuro-ophthalmic features. Most common fundus findings were papilloedema and optic atrophy. Most common visual field defect were enlarged blind spot, homonymous hemianopia and quadrantanopia.Others neuro-ophthalmic features were relative afferent papillary defect, ocular motor nerve palsy, diplopia, ptosis, proptosis and nystagmus.

Acknowledgement

We express our gratitude to Professor Dr. Anisur Rahman Anjum Sir as well as participant of the patient of Dhaka Medical College and Hospital.

References

01. Salehpour, F., Mirzaei, F., Meshkini, A., Parsay, S., Salehi, S. & Asl, M.B., 2019. Trends in primary brain tumors: A 5-year retrospective histologically confirmed study in Tabriz, Iran, 2011–2016. Asian Journal of Neurosurgery, 14(2), 427.

02. Farmanfarma, K.K., M.Mohammadian, Shahabinia, Z., S.Hassanipour & H.Salehiniya, 2019. Brain cancer in the world: An epidemiological review. World Cancer Research Journal, 6, 01–05.

03. Masaya-anon, P. & Lorpattanakasem, J., 2008. Intracranial tumors affecting visual system: 5-Year review in Prasat Neurological Institute. Journal of the Medical Association of Thailand, 91(4), 515–519.

04. Helen, O.O., Oluwole, K.E., Folasade, A., Abiodun, A.A., Oluremi, O.S., Odunmorayo, A.A.,et al.,, 2009. Opthalmic manifestations in patients with intracranial tumours. African Journal of Neurological Sciences, 28(1), 53–60.

05. Deshmukh, S., Das, D., Bhattacharjee, H., Kuri, G., Magdalene, D., Gupta, K.,et al.,, 2018a. Profile of brain tumors having ocular manifestations in a Tertiary Eye Care Institute: A retrospective study. TNOA Journal of Ophthalmic Science and Research, 56(2), 71.

06. Wadud, S.A., Ahmed, S., Chowdhury, N. & Chowdhury, D., 2014. Evaluation of ophthalmic manifestations in patients with intracranial tumours. Mymensingh medical journal : MMJ, 23(2), 268–271.

07. Sefi-Yurdakel, N., 2015. Visual findings as primary manifestations in patients with intracranial tumors. Int J Opthalmol, 8(5), 800–803.

08. Masaya-anon, P. & Lorpattanakasem, J., 2008. Intracranial tumors affecting visual system: 5-Year review in Prasat Neurological Institute. Journal of the Medical Association of Thailand, 91(4), 515–519.

09. Ogra, S., Nichols, A.D., Stylli, S., Kaye, A.H., Savino, P.J. & Danesh-Meyer, H. V., 2014. Visual acuity and pattern of visual field loss at presentation in pituitary adenoma. Journal of Clinical Neuroscience, 21(5), 735–740.

10. Buerki, R.A., Horbinski, C.M., Kruser, T., Horowitz, P.M., James, C.D. & Lukas, R. V., 2018. An overview of meningiomas. Future Oncology, 14(21), 2161–2177.

11. Kitthaweesin, K. & Ploypraśith, C., 2008. Ocular manifestations of suprasellar tumors. Journal of the Medical Association of Thailand, 91(5), 711–715.

12. Mehrazin, M., Rahmat, H. & Yavari, P., 2006. Epidemiology of primary intracranial tumors in Iran, 1978-2003. Asian Pacific journal of cancer prevention : APJCP, 7(2), 283–288.

13. Neacşu, E., Bogdănici, C. & Ianovici, N., 2008. Papillary edema in expansive intra-cranial tumors. Oftalmologia (Bucharest, Romania : 1990), 52(1), 78–83.

14. Aui-Aree, N., Phruanchroen, C., Oearsakul, T., Hirunpat, S. & Sangthong, R., 2010. Three years experience of suprasellar tumors in neuro-ophthalmology clinic. Journal of the Medical Association of Thailand, 93(7), 818–823.

15. Tagoe, N.N., Essuman, V.A., Fordjuor, G., Akpalu, J., Bankah, P. & Ndanu, T., 2015. Neuro-Ophthalmic and Clinical Characteristics of Brain Tumours in a Tertiary Hospital in Ghana. Ghana medical journal, 49(3), 181–186.