IJCRT.ORG ISSN : 2320-2882

INTERNATIONAL JOURNAL OF CREATIVE RESEARCH THOUGHTS (IJCRT)

An International Open Access, Peer-reviewed, Refereed Journal

A REVIEW ON BRAIN TUMOR

Parinita B. Suryawanshi [1], Avirali B. Landge [2], Dnyaneshwari S. Bachhav [3], Dipti M. Suryawanshi[4] , Vijay V. Pawar [5].

Student [1], Student [2] , Student [3], Student [4], Assistant professor [5].

Dr. Babasaheb Ambedkar Technological University Lonere, Raigad, India.

Abstract: Brain tumor is a cancerous or non cancerous mass or growth of abnormal cell in the brain. Although brain tumours are not common, many individuals who have them suffer headaches. In most cases, severe headaches are accompanied by other neurologic symptoms and indications. detection of Brain Tumor is Magnetic resonance imaging (MRI) scans. Is an essential component of targeted therapy is cancer grading. The development of non-invasive, affordable, and effective techniques for brain cancer characterization and grade estimation is urgently needed because cancer detection is so time- and money consuming. Chemotherapeutic drug to destroy the tumor cells and then they include the Sign and symptoms of brain tumor is very depends on the location, size and types for example headache seizures, vision, nausea, dizziness etc. In this paper I tried to summarise the pathophysiology of brain cancer, imaging modalities of brain cancer and automatic computer assisted methods for brain cancer characterization in a machine and deep learning paradigm.

Keyword: Brain tumor, MRI scans, Pathophysiology, Imaging Modality.

1. Introduction:

The many symptoms of brain cancer include memory loss, seizures, mood swings, frequent headaches, changes in speech, changes in mood, and coordination problems. Brain cancer can grow in the brain or spinal cord. A kind of tumour known as brain cancer is one that persists in the brain or central nervous system [1].According to their nature, origin, speed of change, and stage of advancement, brain tumours are divided into several kinds.[2,3] Brain Tumor either malignant brain tumor and benign brain tumor so, malignant brain tumor are what we traditionally think of as cancer Malignant means to spread Ex.
(oligodendrogliomas, high-grade astrocytomas, etc). and benign brain tumor are not cancerous and do not spread to other parts of the body.

Brain tumor are the following two categories that may be used to differentiate between various forms- Primary brain tumours and secondary brain tumours [1].

Classification of brain tumor:

Primary brain tumor:

Brains are the basis of primary brain tumours. Any area along the spinal cord or in the brain might become a tumour.
Most malignant brain tumours in adults begin in the cerebrum, a region of the brain (forebrain). They may also begin in additional areas, such as the:

- tissue layers that protect the brain (meninges)
- pituitary or pineal glands in the spinal cord

Meninges are where the large percentage of benign brain tumours in adults begin. Meningiomas is the term for them.

Secondary brain tumor:

Secondary brain tumours or brain metastases are cancers that have moved from another part of the body to the brain.
The same kind of cells that make up the initial cancer also make up secondary brain malignancies. Therefore, lung cancer cells make up the regions of cancer in the brain if your disease originated in the lungs.
The brain can be affected by cancer of any kind. But the most typical kinds are:

- lung disease
- breast cancer
- renal cancer
- the skin cancer melanoma
- (Colorectal) bowel cancer

This occurs as a result of the ability of cancer cells to break off from the original malignancy and go through the circulation to the brain. They can develop into new tumours there.
The goal of treatment is commonly to manage your symptoms and cancer.

Also, it can eliminate issues from arising.Steroids, radiotherapy, hormone therapy,specific cancer medications, and sometimes surgery are all forms of treatment [4].
In these cases, the classification of a tumour is based on an analysis of the findings from an MRI, and the patient's care is managed properly.

Craniopharyngiomas: This type of tumor is benign and difficult to remove because of its location as it is found deep in the brain.
Gliomas: It is the most common type of malignant brain tumor found in adults, comprising of 78 percent of malignant brain tumors. There are further many forms of Gliomas tumor.

The exact classification of tumours may help in designing the rational therapies for tumours. Thus, there is a need for developing a new computer aided analysis tool that is more objective than the human reader and can provide more reliable tumour diagnostic procedures. The objective of this work is to design an automated tool that helps in evaluating brain MR images by distinguishing between HG and LG gliomas.

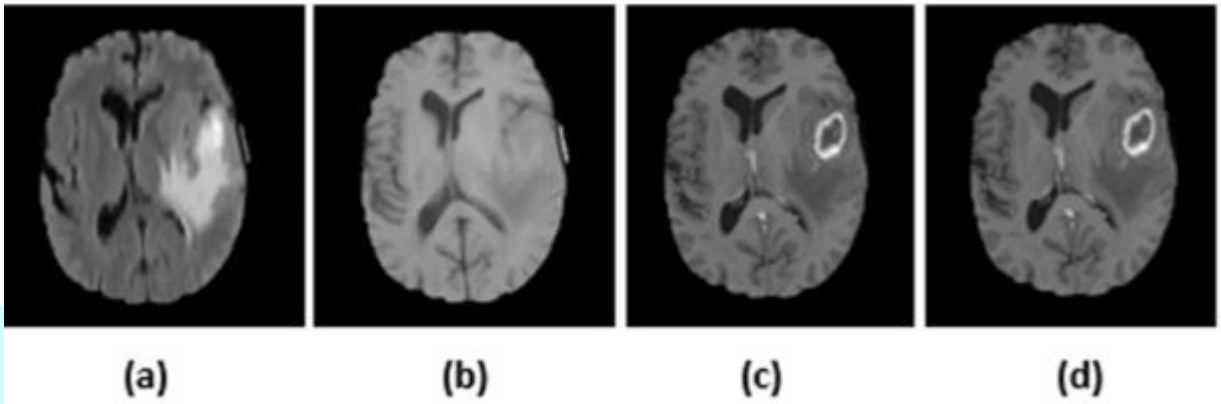

Fig. 1: (a) FLAIR (b) T1-w (c) T1-w contrast enhanced (d) T2-w MRI brain Images with HG glioma colle

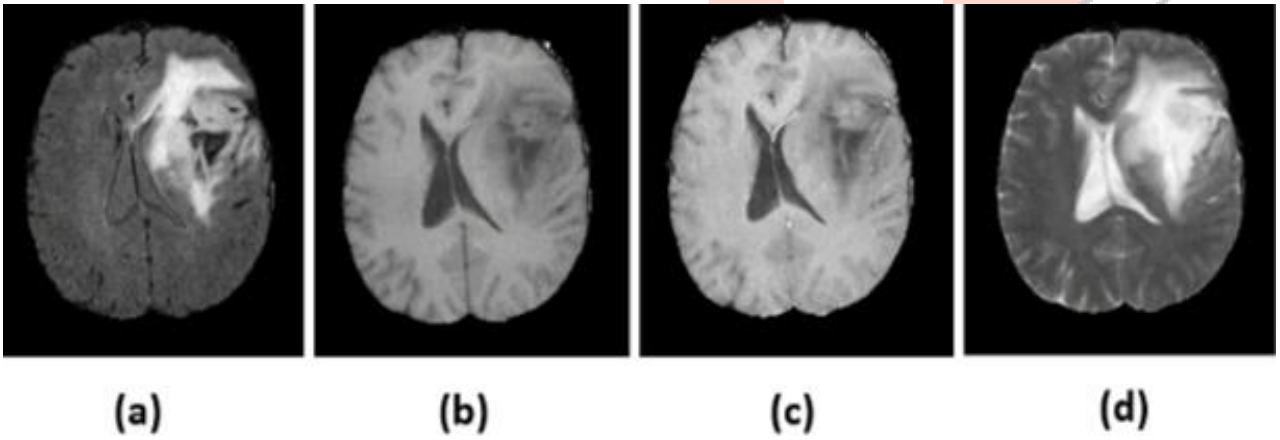

Fig. 2: (a) FLAIR (b) T1-w (c) T1-w contrast enhanced (d) T2-w MRI brain Images with LG glioma colle

2. Pathophysiology of Brain Cancer:

This article discusses the pathophysiology of brain cancer. From the aspect of cellular architecture and how it operates inside the human body, the reasons of brain cancer are discussed.

2.1. Cellular Level Architecture:

The smallest unit of the human body is the cell. Also, it describes how each organ in the body works, including how blood circulates, how oxygen gets to the cells, and how waste is disposed of. The nucleus, which contains millions of genes on 23 pairs of chromosomes, is each cell's primary management structure. The deoxyribonucleic acid in these genes contains the instructions [6].
Three categories are used to categorise the cancer-causing genes. We briefly describe and define each category
(i). Tumor suppressors, which regulate the cell death cycle (apoptosis), make up the first category [7]. There are two signalling routes in this process. In the first pathway, a cell sends out a signal to destroy itself, but in the second, the cell receives the signal from other cells in the area. A mutation in one of the mechanisms slows down this cell death process. If this mutation occurs in both routes, it entirely ceases, resulting in abnormal cell growth [7,8]. RB1, PTEN, and other cell death-related genes are examples of cell suppressor genes [9].

(ii). Repair of the DNA is carried out by the second group of genes. The DNA repair genes MGMT and p53 protein are two examples. Cancer may be introduced on by any malfunction in them.

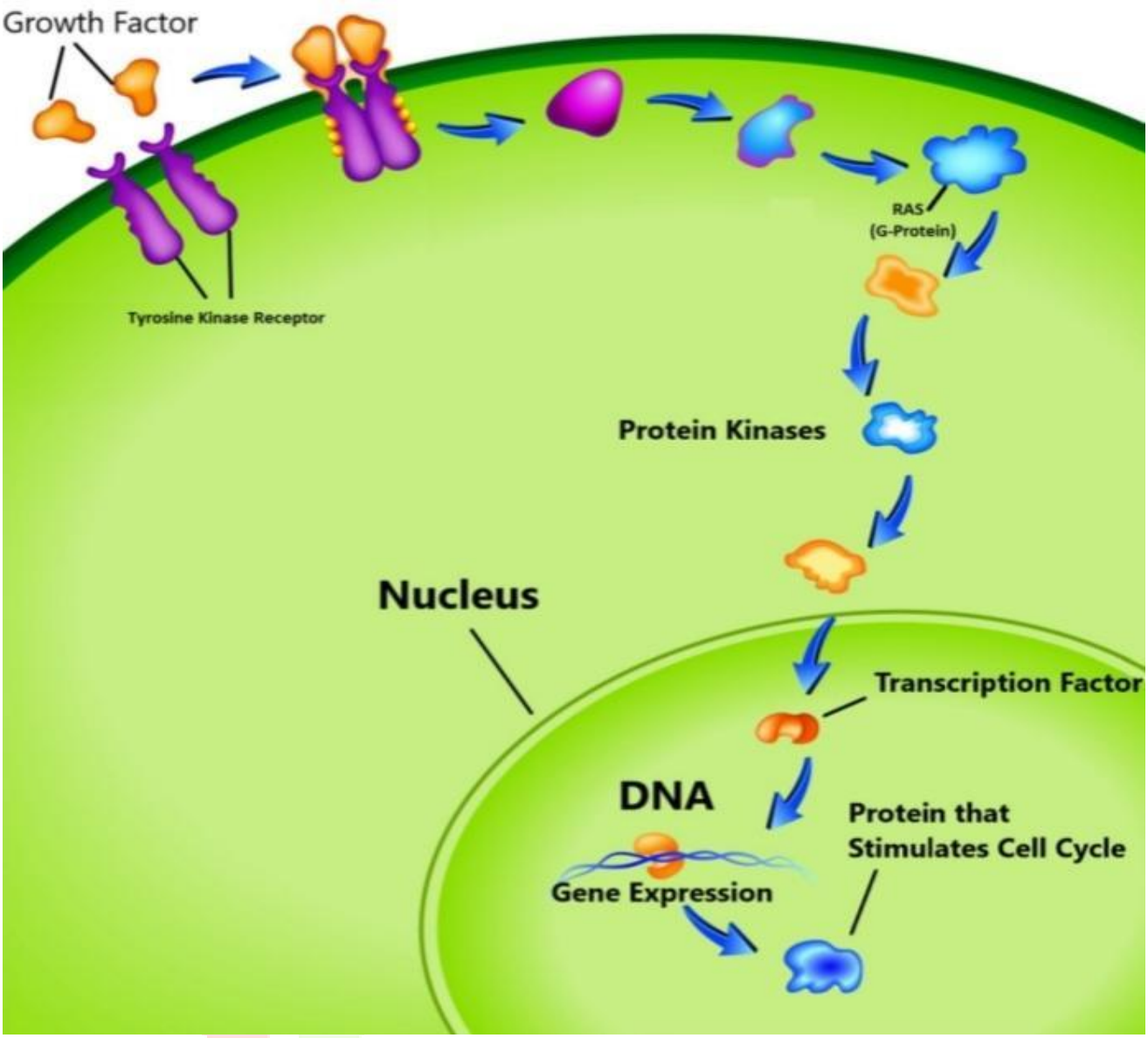

Figure 3. Cell cycle proliferation. (image courtesy: Athero Point TM , Roseville, CA, USA).

(iii). The third group called as Proto-oncogenes, that work in opposition to tumour suppressor genes, are in charge of producing a protein that promotes cell proliferation and prevents normal cell death [10].

2.2. Relevancy between Brain Tumor and Genes :

As discussed in the last section, The cancer is determined by mutations in certain gene types. DNA repair and the start of apoptosis are both facilitated by tumour protein 53 (TP53). High-grade gliomas are known to have relatively irregular Tp53 levels, and mutations have been identified in more than 80% of tumours [11]. A gene that suppresses tumours is called the retinoblastoma (RB1) gene. It is particularly pertinent to glioblastoma and is present in around 75% of brain tumours [11]. A member of the receptor tyrosine kinase (RTK) family, EGFR is a trans- membrane receptor. Higher cell cycle

Higher cell cycle proliferation and increased tumour cell survival will result from EGFR mutation. The majority of the mutations that led to primary glioblastomas are present in it, and 40% of these mutations are detected there [12]. A tumour suppressor gene called PTEN is the cause of 15–40% of the alterations observed in primary glioblastomas. Indifferent glioblastoma may have up to 80% mutation [12]. Enzymes called IDH1 and IDH1 are in charge of the citric acid cycle. Enzyme activity is inhibited by mutations in them. IDH1 mutation is often detected more frequently in high grade glioblastomas (70–80%) than in primary glioma patients (5%). Oligodendroglial cancers frequently have IDH2 mutations [13].

3. Imaging Modality:

Doctors, medical professionals, and researchers can examine into the human body without making any incisions due to medical imaging methods. The primary steps and difficulties in treating cancer include cancer diagnosis, grade estimation, therapy response

evaluation, patient prognosis, and surgical planning. Hospitals all around the world utilise a variety of medical imaging techniques for various types of treatments. The two categories of brain imaging methods are structural imaging and functional imaging [14].
CT and MRI are used for brain tumor analysis and are able to capture different cross sections of the body without surgery [15,16].

- Computed Tomography Imaging
- Magnetic Resonance Imaging
- Biopsy
- Hyperstereoscopy Imaging
- MR Spectroscopy

4. Brain Tumor Tests:

During a neurological examination, the doctor tests the patient's reflexes, muscle strength, vision, hearing, awareness, and vision. A patient's eyes may also be examined by the doctor to check for edeoma. Major tests to confirm cancer and its grade include brain scans, tumour biopsies, and biomarkers. Depending on the patient's state, the doctor may recommend any one of them if they discover any symptoms of brain cancer in order to confirm the tumor malignancy. The following subsections list a few of the tests.

- Biomarker Test
- Biopsy
- Imaging Test

5. Classification Methods:

When a machine is given a task, machine learning (ML)is the process through which the machine's performance becomes better over time [17]. The two categories of ML algorithms are supervised learning and unsupervised learning [18,19]. ML algorithms learn from labelled data in supervised learning. The ML algorithms use unlabelled data to understand the relationships between the variables in unsupervised learning. ML has been utilised to describe brain cancers in the context of brain image analysis [19,20].The inner workings of ML algorithms consist of two stages: Cancers 2019, 11, x feature extraction and application of ML algorithm for characterization. The process model is shown in figure 4.

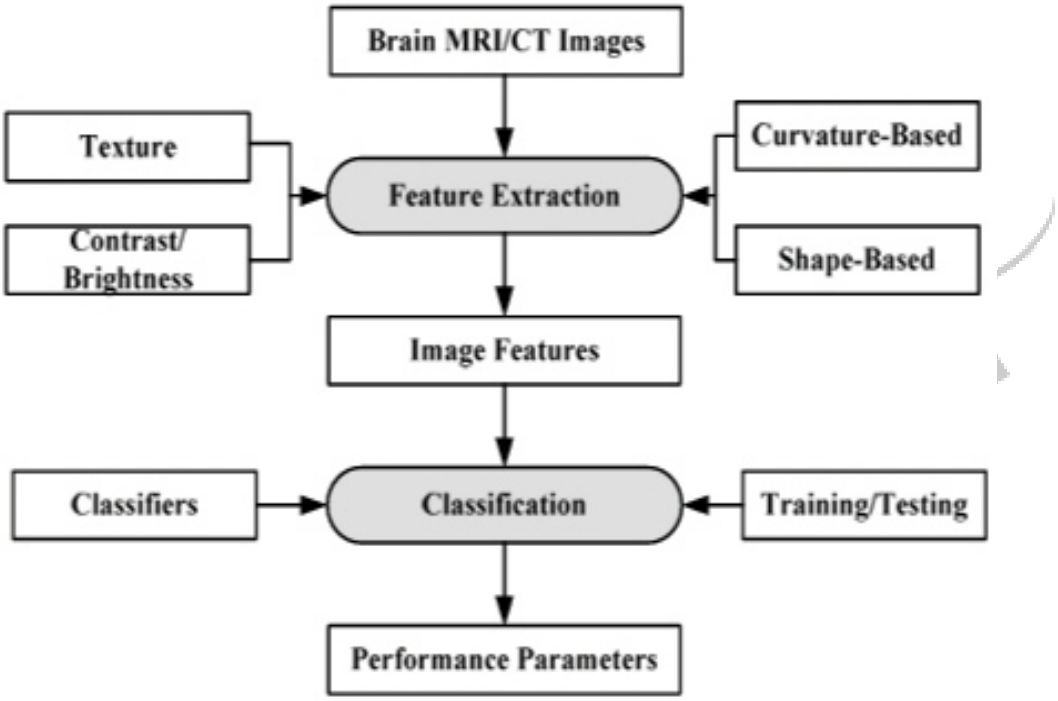

Figure 4. Working of ML-based algorithms.

6. Brain Cancer and Other Brain Disorders: [21,22].

- Stroke
- Alzheimer's Disease
- Parkinson's Disease
- Leukoaraiosis
- Multiple Sclerosis
- Wilson's Disease

Sing and Symptoms:

The signs and symptoms of brain tumors greatly depend upon person to person and the severity of the patient. Further, the symptoms also depend upon the location of the tumor as a different part of the brain is responsible for different activities. Signs and symptoms include:

- Fatigue
- Severe headache
- Nausea or vomiting
- Blurred vision or double vision
- Inability to make decisions
- Hampered memory
- Hearing issue
- Seizures
- Sudden unconsciousness
- Loss of neural control
- Sleeping disorders
- Changes in speech, hearing, memory, emotional outbursts, aggressiveness, and mood swings are all common problems that a patient suffers.

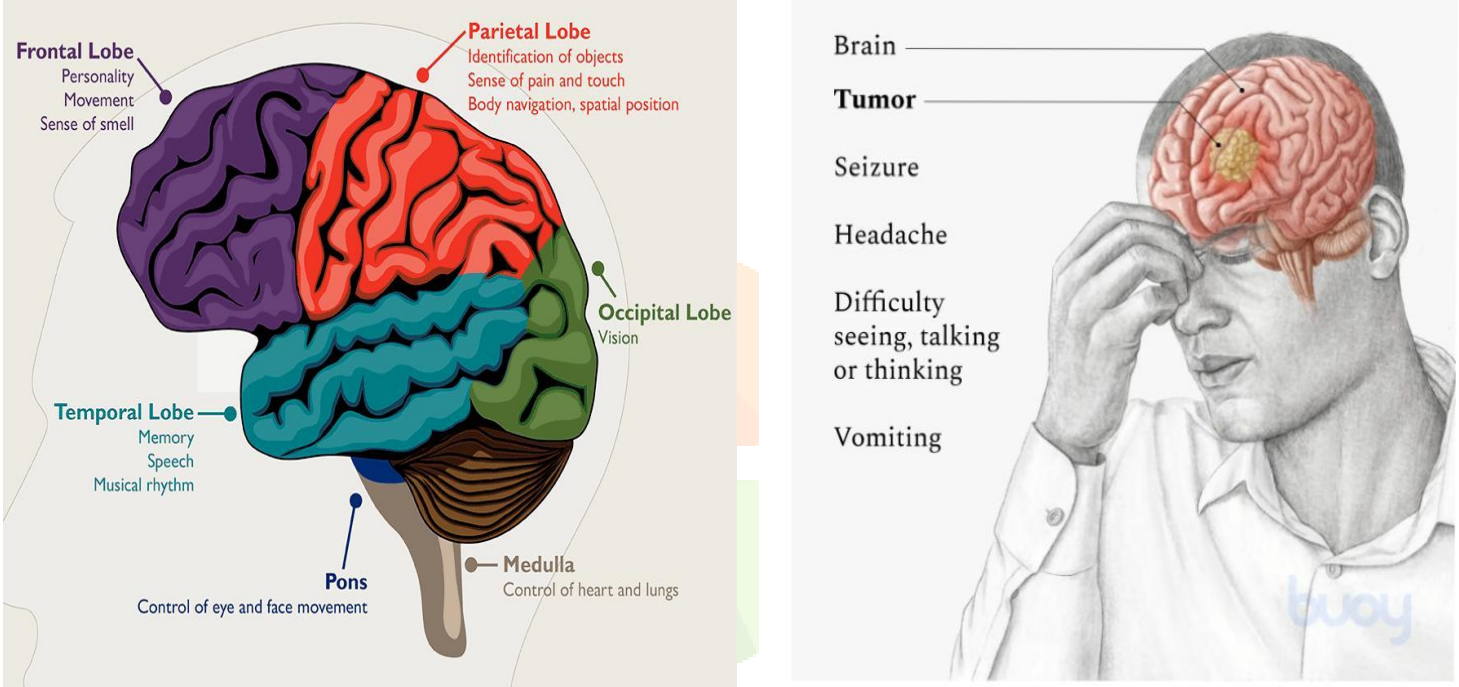

Figure. 5,6. Sign and symptoms of brain tumor

Causes of Brain Tumor:

It is believed that specific genes on a cell's chromosomes become damaged and cease to function correctly when brain tumours grow. These genes generally control how quickly a cell divides (if at all), repair genes that correct other genes' flaws, and genes that should trigger the cell to self-destruct if the damage is too great to be repaired. An individual may occasionally be born with one or more of these genes partially defective. Then, environmental conditions can result in further harm. In other situations, the genetic damage caused by the environment could be the only factor. Why some persons in a "environment" have brain tumours while others don't is unknown. When a cell begins to divide quickly and the internal controls that regulate its development are compromised, the cell may eventually develop into a tumour. The immune system of the body, which ideally would recognise the aberrant cell and eliminate it, may be another line of defence. It's possible for tumours to create chemicals that prevent the immune system from identifying the aberrant tumour cells, therefore overcoming all internal and external inhibitors of their growth.

The local blood supply meant for normal tissue may not be able to meet a tumor's increased requirement for oxygen and nutrients. Angiogenesis factors are chemicals that tumours can make to encourage the formation of blood vessels. The tumour receives more nutrients from the growing new vessels, and over time, the tumour grows reliant on them.

Since some research is being done in this area, more in-depth study is required to turn this information into possible treatments.[25,26]

Risk factors of brain tumor:

While there is typically any known cause for a tumors, there are several factors that raise the risk of developing a brain tumour. Among the risk elements are:

- Age
- Gender
- Family history
- Exposure to infections, viruses, and allergens.

Conclusion:

In this article we have presented the different kinds of classification of brain tumour or brain cancer that includes primary and secondary brain tumor. In secondary brain tumor, it becoms difficult nowadays to manage and control the tumor growth and therefore the important goal is to manage symptoms and keep it under control by natural medication, chemotherapy and surgery if needed. In above review, we are trying to discuss Pathophysiology of brain tumor and how it affects the whole human body, and sometimes as the brain tumor grows very deeply in the brain it becomes challenging to operate on them. Additionally, discuss the main sign and symptoms of brain cancer including loss of neural control, hearing issue, blurred vision, etc.

Acknowledgement:

We Have grateful acknowledge by Vijay v. Pawar for helpful discussion for Brain cancer.

References:

1.Brain Tumor Basics. Available online: https://www.thebraintumourcharity.org/

2.American Cancer Society website. Available online: www.cancer.org/cancer.html

3.Brain Tumor Diagnosis. Available online: https://www.cancer.net/cancer-types/brain-tumor/diagnosis.

4.Brain cancer type. Available online: https://www.cancerresearchuk.org/about-cancer/brain-tumours/types/primary-secondary-tumours.

5. B. H. Menze et al., "The multimodal brain tumor image segmentation benchmark (BRATS)," IEEE transactions on medical imaging, vol. 34, no. 10, p. 1993, 2015.

6.Griffiths, A.J.F.; Wessler, S.R.; Lewontin, R.C.; Gelbart, W.M.; Suzuki, D.T.; Miller, J.H. An Introduction to Genetic Analysis; Macmillan: New York, NY, USA, 2005.

7. Evan, G.I.; Vousden, K.H. Proliferation, cell cycle and apoptosis in cancer. Nature 2001, 411, 342. [CrossRef]

8. Burch,P.R. The Biology of Cancer: A New Approach; Springer Science & Business Media: New York, NY, USA, 2012.

9. Song, M.S.; Salmena, L.; Pandolfi, P.P. The functions and regulation of the PTEN tumoursuppressor. Nat. Rev. Mol. CellBiol. 2012, 13, 283. [CrossRef]

10. Rak, J.; Filmus, J.; Finkenzeller, G.; Grugel, S.; Marme, D.; Kerbel, R.S. Oncogenes as inducers of tumor angiogenesis. Cancer Metastasis Rev. 1995, 14, 263–277. [CrossRef]

11. Mabray, M.C.; Barajas, R.F.; Cha, S. Modern brain tumor imaging. Brain tumor research and treatment 2015, 3, 8–23. [CrossRef]

12. Hegi, M.E.; Murat, A.; Lambiv, W.L.; Stupp, R. Brain tumors: Molecular biology and targeted therapies. Ann. Oncol. 2006, 17, x191–x197. [CrossRef]

13. Yan, H.; Parsons, D.W.; Jin, G.; McLendon, R.; Rasheed, B.A.; Yuan, W.; Kos, I.; Batinic-Haberle, I.; Jones, S.; Riggins, G.J.; et al. IDH1 and IDH2 mutations in gliomas. N. Engl. J. Med. 2009, 360, 765–773. [CrossRef] [PubMed]

14. Amyot, F.; Arciniegas,, D.B.; Brazaitis, M.P.; Curley, K.C.; Diaz-Arrastia, R.; Gandjbakhche, A.; Herscovitch, P.; Hindsll, S.R.; Manley, G.T.; Pacifico, A.; et al. A review of the effectiveness of neuroimaging modalities for the detection of traumatic brain injury. J. Neurotrauma 2015, 32, 1693–1721. [CrossRef] [PubMed]

15. Morris,Z.; Whiteley, W.N.; Longstreth, W.T.; Weber, F.; Lee, Y.; Tsushima, Y.; Alphs, H.; Ladd, S.C.; Warlow, C.; Wardlaw, J.M.; et al. Incidental findings on brain magnetic resonance imaging: Systematic review and meta-analysis. BMJ 2009, 339, b3016. [CrossRef] [PubMed].

16. Lagerwaard, F.; Levendag, P.C.; Nowak, P.J.C.M.; Eijkenboom, W.M.H.; Hanssens, P.E.J.; Schmitz, P.M. Identification of prognostic factors in patients with brain metastases: A review of 1292 patients. Int. J. Radiat. Oncol. Biol. Phys. 1999, 43, 795–803. [CrossRef]

17.Haykin, S.S. Neural Networks and Learning Machines; Pearson: Upper Saddle River, NJ, USA, 2009; Volume 3.

18. Nasrabadi, N.M. Pattern recognition and machine learning. J. Electron. Imaging 2007, 16, 049901. [CrossRef]

19. Wernick, M.N.; Yang, Y.; Brankov, J.G.; Yourganov, G.; Strother, S.C. Machine learning in medical imaging. IEEE Signal Process. Mag. 2010, 27, 25–38. [CrossRef] [PubMed]

20. Erickson, B.J.; Korfiatis, P.; Akkus, Z.; Kline, T.L. Machine learning for medical imaging. Radiographics 2017, 37, 505–515. [CrossRef]

21. Kreisl, T.N.; Toothaker, T.; Karimi, S.; DeAngelis, L.M. Ischemic stroke in patients with primary brain tumors. Neurology 2008, 70, 2314–2320. [CrossRef] [PubMed]

22. Burns, A.; Iliffe, S. Alzheimer's disease. BMJ 2009, 338, b158. [CrossRef] [PubMed].

23. Brain tumor symptoms Available online: https://bmchrc.org/brain-tumor-an-overview/

24. Symptoms of brain tumor image (5). Available online: https://www.hopkinsmedicine.org/health/conditions-and-diseases/brain-tumor

25.https://www.aans.org/en/Patients/Neurosurgical-Conditions-and-Treatments/Brain-Tumors

26. https://spanferkel-party.de/which-disorder-involves-a-gene-on-the-x-chromosome-that-is-injured-quizlet.html