

# Effect of lifestyle and dietary factors in the development of brain tumors

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## ABSTRACT

**Introduction:** A brain tumor occurs when neurons are mutated and thus abnormal cells are formed. Glioma and meningioma are the two most common types, comprising approximately 75% of all brain tumors. The incidence rate of all primary brain tumors was 15.80/100,000 person-years in females and 14.33/100,000 person-years in males. An association of higher risk of brain tumors in adults with cured meat and fruit/vegetable consumption, the primary source of dietary *N*-nitroso compounds, is seen. Cigarette smoking is a major source of chemical carcinogens. The present study aimed at determining the effects of lifestyle and dietary habits in the development of brain tumor. **Methods:** The study aimed at the assessment of various dietary factors, lifestyle, and occupational and personal habits in patients diagnosed with brain tumor in a rural tertiary health-care hospital, using a structured questionnaire and statistical analysis. **Results:** It was observed that - (1) people with stressful, sedentary lifestyle and wrong diet and those addicted to alcohol consumption and the habit of cigarette smoking have higher risk of brain tumors; (2) males are more prone to brain tumors; and (3) among subtypes, majority had glioblastoma and the least had meningioma and opdivoglioblastoma and according to location, majority had cerebellopontine angle tumor and the least had left thalamic glioma and multicentric glioma. Primary care to preoperative brain tumor patients should be given in terms of preventing exposure to radiations, avoiding cigarette smoking, providing healthy diet, and avoiding chronic stress and environmental pollution and postoperative patients should be taken care including avoiding infections by maintaining proper hygiene and providing healthy diet for their speedy recovery. **Conclusion:** People with stressful life condition, wrong diet, and sedentary lifestyle and those addicted to alcohol, with the habit of cigarette smoking, have higher risk of brain tumors. Males are more prone to brain tumors.

**Keywords:** Astrocytoma, brain tumors, glioblastoma, meningioma

Known about the topic:

- A brain tumor occurs when neurons are mutated and thus abnormal cells are formed. Glioma and meningioma are the two most common types, comprising approximately 75% of

all brain tumors

- People residing or working in areas concurrently exposed to chemical factories or radiations being released are more prone to develop brain tumor
- People with sedentary lifestyle and with more stress in life are generally more seen to develop brain tumors.

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This paper adds:

- Lifestyle and dietary factors play a major role in the

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development of brain tumors

- People consuming food products such as cured meat, fruits, and vegetables, which contain large amounts of dietary *N*-nitroso compounds (NOCs) and their precursors, have an association with the development of brain tumors. Hence, they are more prone to develop tumors
- Males are more prone to develop brain tumors compared to females.

## Introduction

A brain tumor occurs when neurons are mutated and thus abnormal cells are formed. Glioma and meningioma are the two most common types of brain tumors, comprising approximately 75% of all brain tumors. The median age at diagnosis is 53 years.<sup>[1]</sup> The world age-standardized incidence rate for all primary brain tumors reported in this review ranged from 4.3 to 18.6/100,000/year. The overall incidence rate of all primary brain tumors was 15.80/100,000 person-years in females and 14.33/100,000 person-years in males.<sup>[2]</sup>

The incidence of central nervous system tumors in India ranges from 5 to 10/100,000 population with an increasing trend and accounts for 2% of malignancies.<sup>[3]</sup> A recent study showed an increase in gliomas, but not meningiomas, in workers concurrently exposed to chemical solvents, pesticides or lead, and low-frequency electromagnetic fields.<sup>[4]</sup> Several studies have examined the association of brain tumors in adults with cured meat and fruit/vegetable consumption with widely inconsistent results.<sup>[5]</sup> Nitrite exposure has been hypothesized as an explanation for the association of both cured meat and fruits/vegetables. Cured meats are the primary source of dietary *N*-nitroso compounds (NOCs) and their precursors.<sup>[6]</sup> NOCs, contained in processed meat, have been long noticed to be associated with higher risk of brain tumor. A recent meta-analysis also indicated that processed meat consumption was associated with higher risk of brain tumor, while intake of vegetables, fruits, and Vitamin A might reduce its risk.<sup>[7]</sup>

Bunin *et al.* found that maternal intake of fish is associated with lower risk of subsequent brain tumors in children.<sup>[8]</sup>

High levels of processed meat consumption might increase the risk for glioma, and findings are consistent with the hypothesis. No association has been found between red meat consumption and glioma risk.<sup>[9]</sup>

Cigarette smoking is a major source of multiple systemically absorbed chemical carcinogens including, among others, polycyclic aromatic hydrocarbons and NOCs. Among smokers, tobacco smoke is by far the greatest source of exposure to NOCs.<sup>[10]</sup>

Although nicotine may increase the permeability of the blood-brain barrier, it is unknown if NOCs penetrate the human brain tissue. Lifestyle changes, especially dietary habits, are at the basis of chronic systemic low-grade inflammation, insulin resistance,

and majority of diseases. An inflammatory reaction jeopardizes the high glucose needs of our brain, causing various adaptations, including insulin resistance, functional reallocation of energy-rich nutrients, and changing serum lipoprotein composition.<sup>[11]</sup>

With the advent of the agricultural and industrial revolutions, we have introduced numerous false inflammatory triggers in our lifestyle, driving us to a state of chronic systemic low-grade inflammation that eventually leads to typical Western diseases via an evolutionary conserved interaction between our immune system and metabolism. The underlying triggers are an abnormal dietary composition and microbial flora, insufficient physical activity and sleep, chronic stress, and environmental pollution. The disturbance of our inflammatory/anti-inflammatory balance is illustrated by dietary fatty acids and antioxidants. Association between long term exposure to pm<sub>2.5</sub> absorbance and malignant brain tumours is seen.<sup>[12]</sup>

## Aim

1. To assess the dietary factors in patients diagnosed with brain cancers
2. To assess the lifestyle factors in patients diagnosed with brain cancers
3. To assess the occupational factors and personal habits in patients diagnosed with brain tumor.

## Methodology

- Study type – Observational study
- Sample size – Twenty brain tumor patients
- Design of study – Cross-sectional study
- Study duration – 3 months.

## Sampling procedure

The study was conducted on twenty brain tumor patients, who were admitted in a rural tertiary health-care hospital, for 3 months in 2018. The selected patients were explained the study objectives and their consent for participation was taken.

Sociodemographic characteristics; dietary, occupational, and lifestyle factors; and personal habits such as alcohol addiction and cigarette smoking were collected using a structured questionnaire after obtaining informed consent from all the patients. All the patients were inquired details regarding the environment, method of garbage disposal, presence of any factories, etc., around their houses. After collecting all the above-mentioned data using appropriate software, results were obtained.

## Inclusion criteria

- All the preoperative and postoperative brain tumor patients
- Patients of all ages and both genders.

## Exclusion criteria

- Patients who did not have the hospital outpatient department card were not included in the study.

Confidentiality was maintained throughout the research. The study was conducted after clearance from the institutional ethics committee.

### Data collection tool

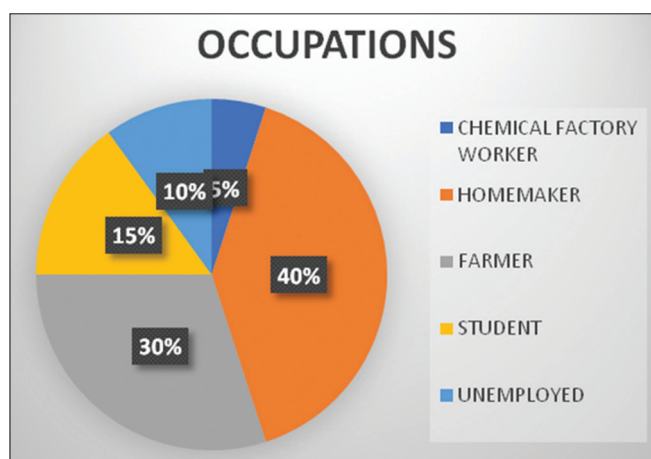
A questionnaire in English language was prepared to include various parameters of the study in accordance with the ethical guidelines. The questionnaire was explained to the patients in their own local languages such as Hindi and Marathi to help them fill it.

### Analysis plan

Data obtained were statistically analyzed using software ANOVA version 7.2. XLSTAT by Addinsoft.

## Results

1. People with stressful life condition, wrong diet, and sedentary lifestyle and those addicted to alcohol, with the habit of cigarette smoking, have higher risk of brain tumors as shown in Table 1
2. Males are more prone to brain tumors
3. Among subtypes, majority had glioblastoma (GBM) and the least had meningioma and opdivoglioblastoma
4. According to the location, majority had cerebellopontine (CP) angle tumor and the least had left thalamic glioma and multicentric glioma
5. According to occupational data, majority were homemakers and the least were chemical factory workers, as shown in Figure 1



**Figure 1:** The occupation data of the patients. Majority were housewife and the least were chemical factory workers

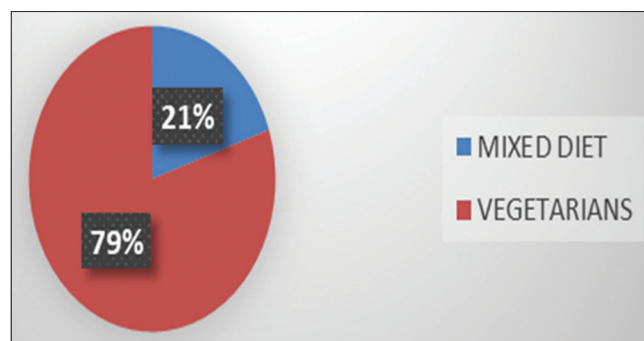
6. Most of them consumed vegetarian diet and had no stress in their life, as shown in Figures 2 and 3.

## Discussion

The aim of the present study was to explore the effect of lifestyle and dietary factors in the development of brain tumors in a tertiary rural health-care hospital. We observed significant direct associations between people with stressful life, wrong diet, and sedentary lifestyle and those addicted to alcohol, with the habit of cigarette smoking, and brain tumors. Males are more prone to develop brain tumors as compared to females. Among subtypes, the most common type of brain tumor observed was GBM and the least observed was meningioma and opdivoglioblastoma. According to the study, the most common location observed was CP angle tumor and the least had tumor in the left thalamic glioma and multicentric glioma. According to occupation, majority of the women were homemakers and men were farmers and a minimum of them were chemical factory workers. Most of them consumed vegetarian diet.

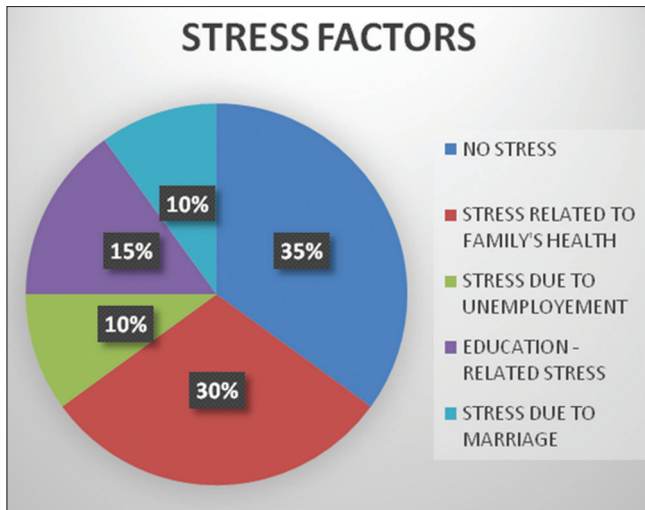
Henceforth, primary care should be given to preoperative brain tumor patients in terms of preventing exposure to radiations; avoiding cigarette smoking; implementing healthy diet including fruits and vegetables; and avoiding chronic stress and environmental pollution and postoperative patients should be taken care including avoiding infections by maintaining proper hygiene and providing healthy diet for their speedy recovery.

The best recommended way to promote enhanced recovery of operated brain tumor patients falls into two important aspects, with the first aspect being educating the patients and spreading awareness among patients pertaining to lifestyle changes, diet modifications, and reduction of exposure to



**Figure 2:** The dietary data of the patients. Majority had a vegetarian diet

Table 1: Sociodemographic characteristics and lifestyle factors of the study population				
Sex ratio	Occupational factors such as exposure to radiations and chemical factories	Addiction to alcohol/ hookah/smoking/tobacco	Stress in daily life	Type of diet
Male: 55%	Not exposed: 15	Not addicted: 14	No stress: 7	Mixed diet: 12
Female: 45%	Exposed: 5	Addicted: 6	Other stresses (education, employment, marriage): 7	Vegetarians: 8
			Stress related to family's health: 7	



**Figure 3:** The data on the different stress factors of the patients. Majority of the patients had no stress and a minimum had stress related to marriage and unemployment

environment pollution. Patients with brain tumor need to be educated and made aware of certain important aspects pertaining to brain tumor. The second aspect is to promote health care among these brain tumor patients through follow-up and frequent checkups.

In a study conducted by Sun *et al.* in 2015, similar results were reported which opined that gliomas occur more commonly in males and do so with some restriction to specific oncogenic mechanisms. Four molecular subtypes of GBM are recognized with disparity in male-to-female ratios (2:1). Hence, an important observation made by the study was that males are more prone to brain tumors compared to females.<sup>[13]</sup>

Another large prospective study conducted by Moore *et al.* in 2009 on males and females aged 50–71 years showed similar results, which demonstrated that at baseline, adult height and obesity at age 18 were strongly associated with increased glioma risk, whereas physical activity at ages 15–18 was associated with decreased glioma risk. The study concluded that people with a sedentary lifestyle and obesity are more prone to develop brain tumors compared to those who do physical activities.<sup>[14]</sup>

Terry *et al.* conducted a case–control study of adult diet and brain tumor risk in 2013 and showed similar results in which significant inverse risk associations between leafy green and yellow-orange vegetables and gliomas were observed and a slightly increased and significant glioma risk was associated with noncured meat. Significant positive risk associations between egg, grain, and citrus fruit consumption and gliomas were also observed. The study concluded increased risk association of people with diet including noncured meat, egg, grain, citrus fruit and brain tumour.<sup>[15]</sup>

The present study found that there was a major lack of awareness among the general population at large in and around the hospital,

which is similar to the findings of reports obtained in other studies from different parts of India with regard to the effect of lifestyle and diet among patients with brain tumor. All over the country, not much effort has been taken to develop awareness among people, hence there was a strong need for the present study.

Awareness regarding brain tumor as a noncommunicable disease and a cause of morbidity increased among the patients after sensitization and education on the same. The patients were also made aware regarding lifestyle modifications and dietary habits to be adopted.

## Conclusion

People with stressful life condition, wrong diet, and sedentary lifestyle and those addicted to alcohol, with the habit of cigarette smoking, have higher risk of brain tumors. Males are more prone to brain tumors.

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Nil.

## Conflicts of interest

There are no conflicts of interest.

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