ABSTRACT: Diet containing N-nitroso compound has been introduced as an environmental factor in the etiology of brain tumor with incidence of 6-8 per 100,000 in USA. Previous studies have not compared the incidence rate of brain tumor in two regions having different dietary pattern. To address this gap, a study designed to find out the incidence of brain tumor in Qazvin city (Iran), which has different dietary pattern from western society. Using newly diagnosed brain tumor, the incidence rate of brain tumor determined during years 2007-8 and dietary pattern of region extracted from previous conducted studies. This study revealed that, although there was different dietary pattern in urban and rural area of study, but the brain tumor incidence was 4 per 100,000 in both regions. Also, the dietary pattern in the region was different from western societies, but the brain tumor incidence rate was comparable with those of USA. We suggest that there might be other environmental factor affecting etiology of brain tumor too.

KEY WORDS: Brain Tumor, Diet, Epidemiology, and Tumor Incidence

INTRODUCTION

Diet is thought to be an important environmental factor in the etiology of several major cancers including brain cancer with an incidence of 6-8 per 100,000 in USA (SEER, 2008; Bunin et al., 1993; Chen, 2002; Pereira, 2001). However, after decades of research in the field of nutritional epidemiology there are still inconsistent results on the relationships between diet and brain tumor, which affect adults and children and is a significant cause of mortality and morbidity. Nitrite exposure has been hypothesized as a risk factor whereas nutrient inhibitors such as vitamin C found in fruits and vegetables are considered to reduce the risk (Terry et al., 2009). Several studies have found maternal intake of folates as a factor to reduce the incidence of brain tumor and also serum level of ascorbic acid and α and γ tocopherol in adults inversely has been related to brain tumor (Hunchark et al., 2004). Consumption of cured meats the primary source of dietary N-nitroso compound (NOC) and their precursor are considered a potential factor in pathogenesis of brain tumor (Hunchark et al. 2004; Lencioni, 1999; Preston-Martin, 1982). NOC are largely formed endogenously and have been shown carcinogenic. Furthermore these compounds are considered important in childhood brain tumor pathogenesis through maternal consumption of cured meat during pregnancy (Scanlan, 1983; Huncharek, 2004)). Among the cured meats, especially cooked bacon, concentrations of 10-100 μg kg⁻¹ have been found. This would correspond to consumption of 1 μg of nitrosodimethylamine (NDMA) in a 100-g portion. Much higher concentrations of NDMA (but lower ones of other nitrosamines) have been found in Japanese smoked and cured fish (more than 100 μg kg⁻¹) (Lencioni, 1999). Beer is one source of NDMA, in which as much as 70 μg l⁻¹ has been reported in some types of German beer, although usual levels are much lower (10 or 5 μg l⁻¹); this could mean a considerable intake for a heavy beer drinker of several liters per day (Lencioni, 1999). Food frequency questionnaire (FFQ) study showed that, American people consume around 96±53 g protein a day which is mainly from meats products and also they drink alcohol, which results in more exposure to N-nitrose, compounds (Stuff, 2009). Therefore the aim of this study was to find out the incidence of brain tumor in population whose 60-65% of their energy intake comes from carbohydrate sources and 10-12% from protein sources (Azizi, 2007) with rare source of cured meat and alcohol.

METHODS

Information on newly diagnosed brain tumor among adult population of rural and urban area occurring during 2 years period from 21 of March 2007 to 20 of December 2008 was obtained from district surgery hospital in Qazvin Province. The province covers 15821 km² in North West of Tehran (120 Km from Tehran). The reporting areas included in this analysis were 4 townships.
(Qazwin, Takestan, Abyek, Bou'in-Zahra) and 16 small towns with 44 rural districts, and 1543 villages. Population information extracted from local vital records office (SCI, 2008). Brain tumor incidences were calculated for years 2008 and 2007, as cases per 100,000 persons. The rates were calculated for population ≥ 15 years old. Dietary and food consumption pattern of area obtained from previous study conducted in the province (Ghaffari, 1999). Signed consent form for releasing data was obtained from participant patients. Research committee of Shahid Rajaee hospital approved the procedure.

RESULTS

The population of the Qazvin province was 1.16 million and 1.18 million people in year 2007 and 2008 respectively, of which 68.05% lived in the cities and 31.95% lived in the villages. Concerning the sex-ratio, the ratio of men to women was 50.7 to 49.3%. About 60% of population was = 15 years old (SCI, 2008) (table 1). As table 2 shows incidence of brain tumor among adults ≥ 15 years old was 3.9 and 4.2 per 100,000 in year 2007 and 2008 respectively. Incidence of brain tumor among men and women was similar (4 per 100,000) and also combined incidence in years 2007 and 2008 in rural and urban area was similar (4 per 100,000). Extracted data from previous dietary survey in the region in the table 3 shows that, consumption of meat among urban population was as low as 30 g a day and frequency of cured meat and N-nitroso compound containing products consumption was once a year. In rural area there was no cured meat consumption (table 3).

TABLE 1. Demographic information of studied area

<table>
<thead>
<tr>
<th>YEAR</th>
<th>RURAL POPULATION (%)</th>
<th>URBAN POPULATION (%)</th>
<th>TOTAL POPULATION</th>
<th>SEX RATIO M/F (%)</th>
<th>TOTAL POPULATION &lt;15 YEAR</th>
<th>TOTAL POPULATION ≥ 15 YEAR</th>
</tr>
</thead>
<tbody>
<tr>
<td>2007</td>
<td>371,200 (32%)</td>
<td>788,800 (68%)</td>
<td>1,160,000</td>
<td>50.7/49.3</td>
<td>464,000</td>
<td>696,000</td>
</tr>
<tr>
<td>2008</td>
<td>377,600 (32%)</td>
<td>802,400 (68%)</td>
<td>1,180,000</td>
<td>50.7/49.3</td>
<td>472,000</td>
<td>708,000</td>
</tr>
</tbody>
</table>

TABLE 2. Number and incidence of diagnosed brain tumor among adults (≥ 15 year) per 100,000 populations

<table>
<thead>
<tr>
<th>YEAR</th>
<th>MALE (URBAN/RURAL)</th>
<th>FEMALE (URBAN/RURAL)</th>
<th>TOTAL DIAGNOSED TUMORS (≥15 YEAR)</th>
<th>INCIDENCE (URBAN)</th>
<th>INCIDENCE (RURAL)</th>
<th>INCIDENCE (TOTAL)</th>
</tr>
</thead>
<tbody>
<tr>
<td>2007</td>
<td>10/3</td>
<td>9.5</td>
<td>27</td>
<td>4</td>
<td>3.6</td>
<td>3.9</td>
</tr>
<tr>
<td>2008</td>
<td>11/4</td>
<td>9.6</td>
<td>30</td>
<td>4.15</td>
<td>4.4</td>
<td>4.2</td>
</tr>
<tr>
<td>Combined 2007-8</td>
<td>21/7</td>
<td>18.11</td>
<td>57</td>
<td>4.08</td>
<td>4</td>
<td>4.05</td>
</tr>
</tbody>
</table>

TABLE 3. Daily energy, macronutrient intake and meat consumption of adults in urban and rural area

<table>
<thead>
<tr>
<th>URBAN/RURAL</th>
<th>ENERGY INTAKE (KCAL)</th>
<th>CARBOHYDRATE % (KCAL)</th>
<th>FAT % (KCAL)</th>
<th>PROTEIN % (KCAL)</th>
<th>RED MEAT (GR)</th>
<th>POULTRY (G)</th>
<th>FREQUENCY OF CURED MEAT CONSUMPTION</th>
</tr>
</thead>
<tbody>
<tr>
<td>Urban</td>
<td>1700±600</td>
<td>60</td>
<td>30</td>
<td>10</td>
<td>30</td>
<td>100</td>
<td>Once a year</td>
</tr>
<tr>
<td>Rural</td>
<td>2500</td>
<td>65</td>
<td>25</td>
<td>10</td>
<td>15</td>
<td>50</td>
<td>Never</td>
</tr>
</tbody>
</table>

Discussion

This study showed that the incidence of brain tumor was 4 per 100000 in adults which was similar among men and women and also in rural and urban area. The incidence rate was lower than that was reported in USA (SEER, 2008). The observed differences can be attributed to increased diagnostic method of brain tumor in USA and European countries and also existence of accurate brain tumor registry system in USA. In several studies brain tumor has been related to consumption of cured meat which contains N-nitroso compound. High sources of N-nitroso compound food groups are included beef, sausage, bacon, wine, hot dog, ham, and beer (Stuff et al., 2009). Using food frequency questionnair (FFQ) and also 7-day food records in Americans showed that a greater proportion of individuals reporting intake of foods high in N-nitroso compound (Stuff et al., 2009). In American population study the median (25th and 75th percentile) of the intake for N-nitroso compound ranged from 0.001-15 µg/day (Stuff et al., 2009). Similar results have been found in study conducted by Brunner et al. (2001) in adult men and women in England in which correlation between energy and alcohol intake and intake of N-nitroso compound were found. In population of our study the consumption of foods containing N-nitros compound ie cured meats and alcohol was very low (Ghaffari, 1999). In a dietary survey in the region of our study, it has been shown that the consumption of cured meat products in urban area was once a month and no consumption of cured meats and alcohol were seen in rural area (Ghaffari, 1999). Although there was significant difference in dietary pattern of western society and population of Qazvin province in terms of the N-nitroso compound intake, but the incidence of brain tumor was similar.

In conclusion consumption of foods having low concentration of N-nitroso compound in rural area and having brain tumor incidence as high as urban area and comparison of diet habit and brain tumor incidence in rural area with urban area and also comparing diet habit of American people with population of our study leads to this result that there might be other important environmental factors which may contribut to pathogenesis of brain tumor too.
ACKNOWLEDGMENT: We thank the staff of Shahid Rejaee hospital for extracting data.

CONFLICT OF INTEREST: There is no conflict of interest

REFERENCES


