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Incidence Trend of Primary Brain Tumors in Children and Adolescents in Iran: A Systematic Review and Meta-Analysis

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Abstract

Background: Brain tumor (BT) is one of the types of tumors that, despite their low prevalence, have many destructive effects on the survival of patients. This study aimed to determine the prevalence of BT in children and adolescents with cancer in Iran.

Method: This meta-analysis was according to the PRISMA checklist. Out of 784 articles extracted in the first stage of systematic review, eight studies examining the incidence rates of brain cancer in people under 18 years of age in Iran met the necessary conditions to be included in the meta-analysis. Data extraction was done using the researcher's checklist; and data analysis was done using CMA3 software.

Result: The prevalence of BT in male patients was revealed to be 1.8% (95% CI, 1.4-2.3), in females, it was 1.9% (95% CI, 1.5-2.3), and its total prevalence was 2.1% (95% CI, 1.7-2.7).

Conclusion: Although the prevalence of BT is not high, due to the important role of these types of tumors in determining the health status of patients, it is required to take the necessary measures including prevention and treatment in the fields of rehabilitation and Drug treatment.

Key Words: Adolescents, Brain tumors, Children, Meta-Analysis, Systematic Review.

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1- INTRODUCTION

If chronic diseases affect a person during childhood and adolescence, they can cause serious harms in the patient's life (1-3). The development of science and technology has led to an increase in the prevalence of chronic diseases worldwide (4, 5); so that in the last century, one of the most critical challenges ahead is the increase of chronic diseases, including cancer. The incidence of cancer in developing countries is increasing due to fundamental changes in the age distribution of countries, urbanization, technological progress, increased life expectancy, and lifestyle changes such as smoking, inactivity, obesity, and stress (6-8).

The survival chances of these patients increased, along with the increase in diagnosis and treatment methods for cancer; but due to the chronicity of the disease, various complications occur in this group of patients (9, 10). Symptoms and complications caused by cancer may appear in both physical and psychological forms. The physical symptoms include pain (11), sleep disorders (12), fatigue (13), nausea, and vomiting (14), and the psychological symptoms include a decrease in self-esteem, life expectancy, and disorder in Mental well-being (15, 16). Considering the impact of cancer on the patients and the complications mentioned above, it is necessary to investigate the prevalence of this disease in different age groups to take the necessary measures regarding the prevention and carrying out therapeutic and rehabilitation interventions (17, 18). In fact, despite the increase in the overall prevalence of cancer, accurate statistics on the prevalence of different types of cancer in different age groups are not available (19, 20).

Cancer has caused complications and deaths in patients, especially in children, where the prevalence of children with cancer is estimated to be about 400,000/year (21). In the group of children and adolescents, we can refer to different types of cancer, including skin, lung, blood, Lawrence, lymph nodes, tongue, and brain cancers (22-24). BT is one of the types of tumors that, despite their low prevalence, have many destructive effects on the survival of patients (25). The central nervous system, with its guiding and controlling role in the body, plays a fundamental and critical role in controlling, directing, and organizing diseases (26). BT can lead to complications such as disorders in sensory organs, function, bladder, vision, etc. (27).

1-1. Purpose of the study

Considering the importance of brain cancer in the world and especially in people under 18 years of age, this study was conducted to determine the prevalence of BT in children and adolescents with cancer in Iran.

2- MATERIALS AND METHODS

This meta-analysis was conducted according to the PRISMA checklist (28), and the studies that examined the incidence rates of BT in patients under 18 years of age in Iran were included in the study.

At first, all the articles investigating the prevalence and incidence of cancer in Iran were extracted, and their methods and findings were reviewed. If the incidence rates were examined in patients with an age range of fewer than 18 years, they were included in the study, and articles with incomplete data were excluded from the study.

The search was conducted by two researchers; the first researcher had an Msc degree in NICU nursing and the second researcher was an Associate Professor of Neurosurgery. In case of any discrepancy in the search and the extracted data, a third person who was Assistant Professor of Pediatric Intensive Care checked the data

and confirmed it with the agreement of the members. Also, if necessary, the search was done again.

The search was performed in SID, MagIran, IranMedex, and IranDoc databases, and international databases of Google Scholar, Cochrane, Embase, ScienceDirect, Scopus, PubMed, and Web of Science (WoS) with keywords of brain cancer, brain tumor, child, adolescent, Incidence, and Iran (Farsi and English equivalent). To decide upon the relevance of the extracted articles, they were reviewed by two authors who are proficient in the research subject, and in case of any discrepancy, it was checked by the third researcher who had a pediatric subspecialty.

Data extraction was done using the researcher's checklist (Author name, age, city, years, Sample size, ASIR); and data analysis was done by the use of the Comprehensive Meta-Analysis software V3.

3- RESULT

According to flowchart number 1, out of 784 articles extracted in the first stage of systematic review, 8 articles met the necessary conditions to enter the meta-analysis stage. All reviewed studies examined children under 19 years of age, and the sample size varied from 1732 in the study by Babaei et al. to 301055 in the study by Amori et al. All the articles were published from 2003 to 2017, and the research communities were in the cities of Kashan, Ardabil, East Azerbaijan, Fars, and in the other cases, data from the registry was collected. (**Table 1**).

Table-1: Characteristics of the included studies on the Incidence of BT

No	Author	Years	Age	City	Sample size			ASIR		
					Male	Female	Total	Male	Female	Total
1	Mehrvar et al (29)	2014	0-15	-	1055	709	1764	2.1	1.9	4.1
2	Asgarian et al (30)	2004	0-14	Kashan	738	476	-	1.51	1.75	-
		2005			761	496	-	2.17	1.35	-
		2006			863	602	-	2.45	2.41	-
		2007			895	629	-	2.42	1.82	-
		2008			1300	894	-	3.4	2.69	-
3	Sdjadi et al (31)	2003	0-14	Ardabil	2072	1309	3455	1	1.3	2.3
4	Babaei et al (32)	2005	0-19	Registry	936	796	1732	3	2.6	2.82
5	Mohagheghi et al (33)	2009	0-14	Registry	-	-	34318	2.3	1.8	3.1
6	Somi et al (34)	2008	0-19	East Azerbaijan	2798	2085	4922	0.76	2	1.2
7	Mehrabani et al (35)	2008	0-14	Fars	1495	1620	3565	0.59	0.48	0.53
8	Amori et al (36)	2017	0-14	Iran	168783	132272	301055	2.06	2.43	2.23

*****ASIR**:** Age-Standardized Incidence Rate

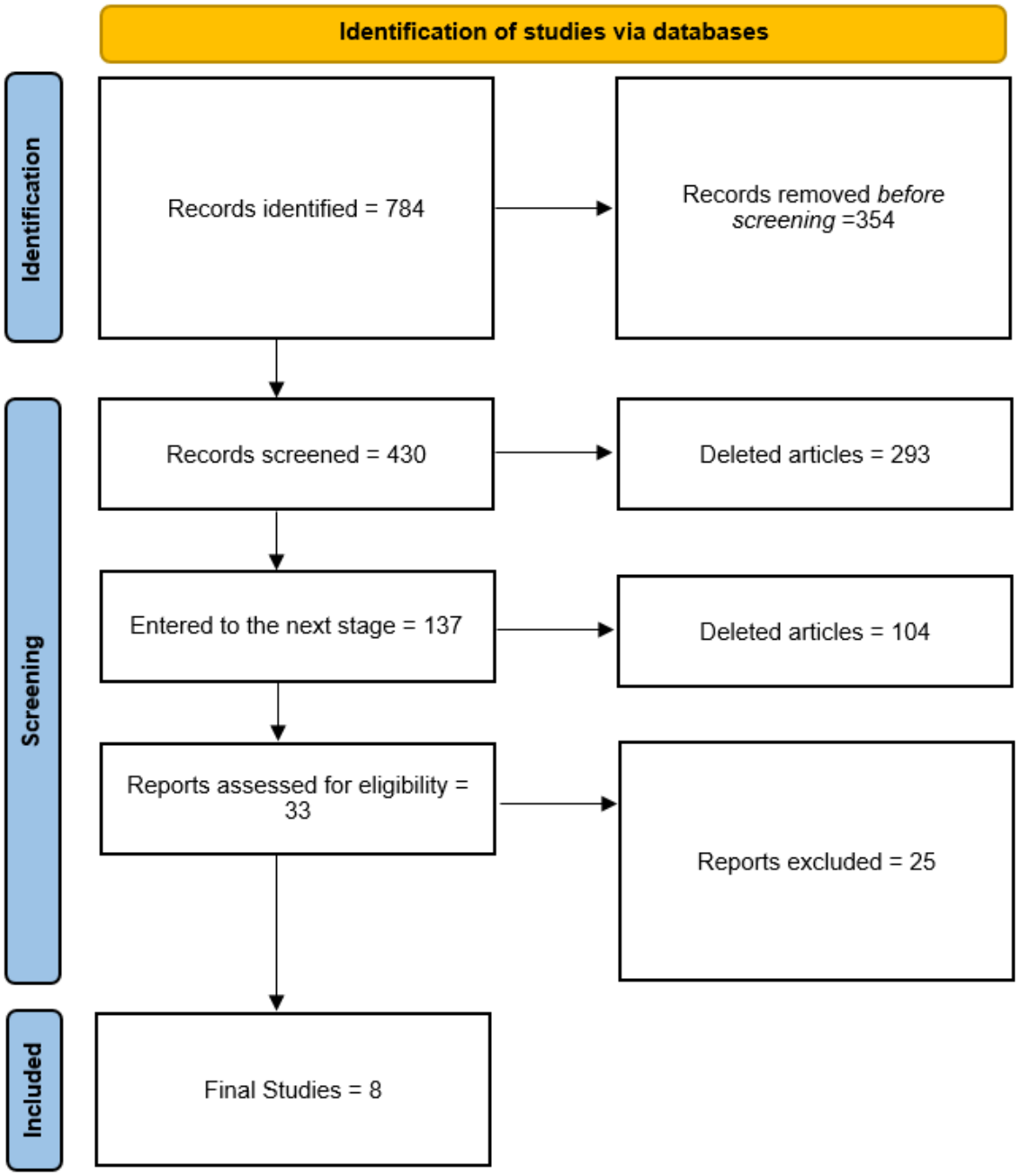

Fig. 1: Flowcharts for systematic review

The result demonstrated that the prevalence of BT in male patient's was 1.8% (95% CI, 1.4-2.3), in females, it was 1.9% (95% CI, 1.5-2.3), and its total prevalence was 2.1% (95% CI, 1.7-2.7) (**Fig. 2, 4,** and **6**). Publication bias plots are shown for men, women, and total patients (**Fig. 3, 5,** and **7**).

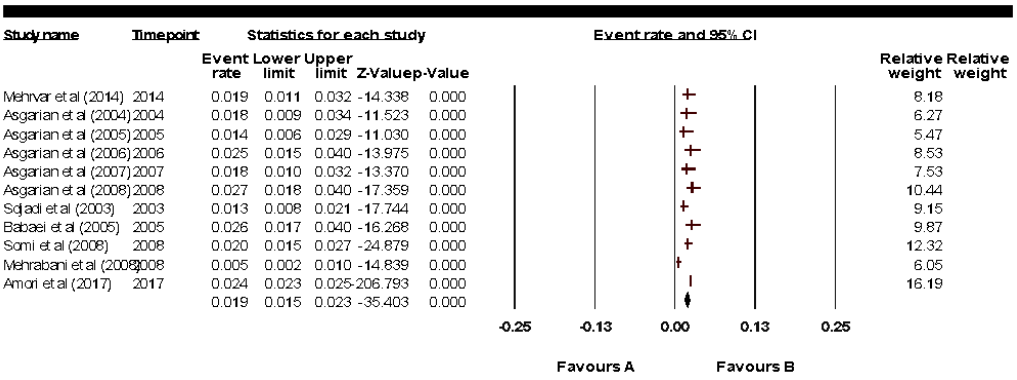

Fig-2: Prevalence of Brain tumor in female children and adolescents in Iran

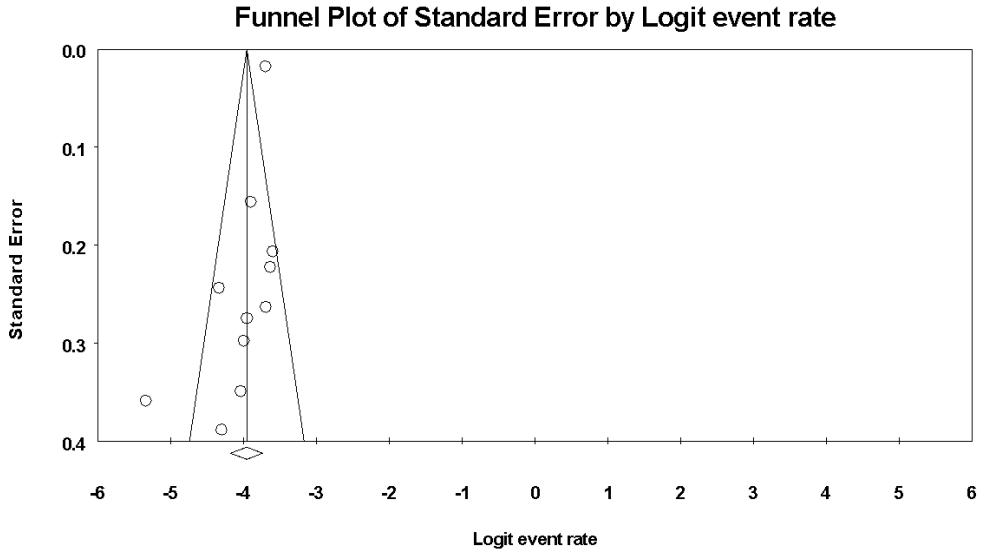

Fig-3: Funnel plot (for Females)

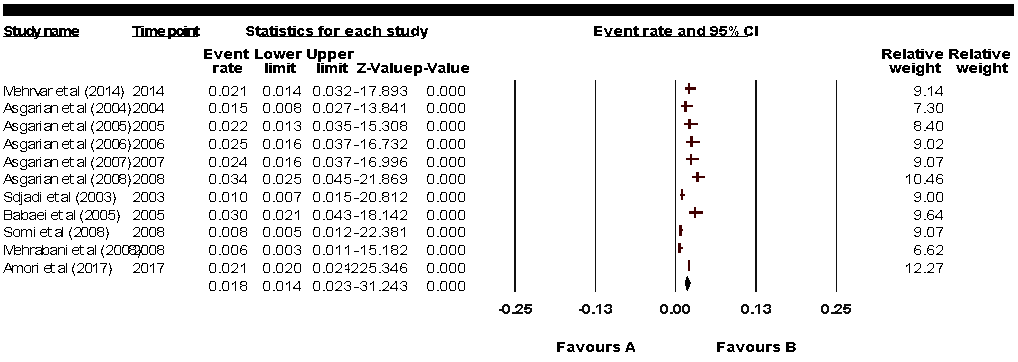

Fig-4: Prevalence of Brain tumor in male children and adolescents in Iran

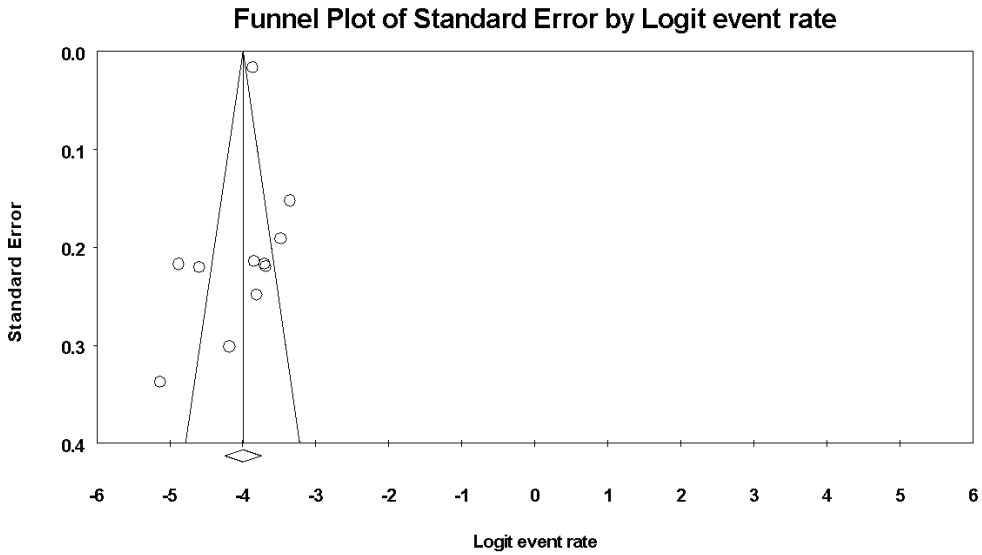

Fig-5: Funnel plot (for Males)

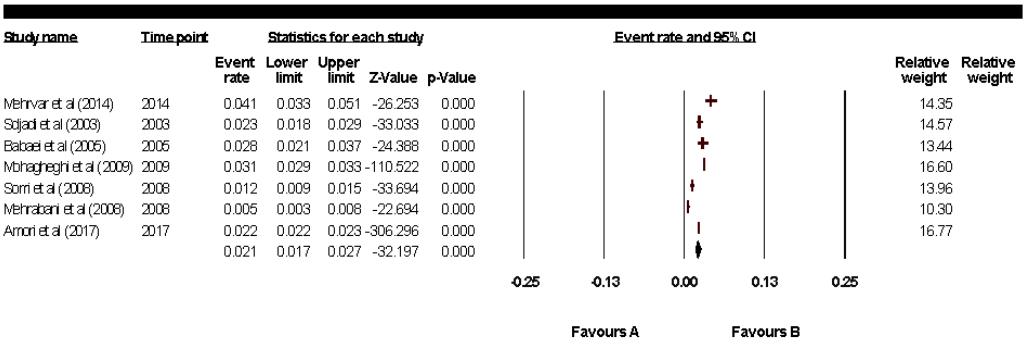

Fig-6: Prevalence of Brain tumor in Total (male and female) children and adolescents in Iran

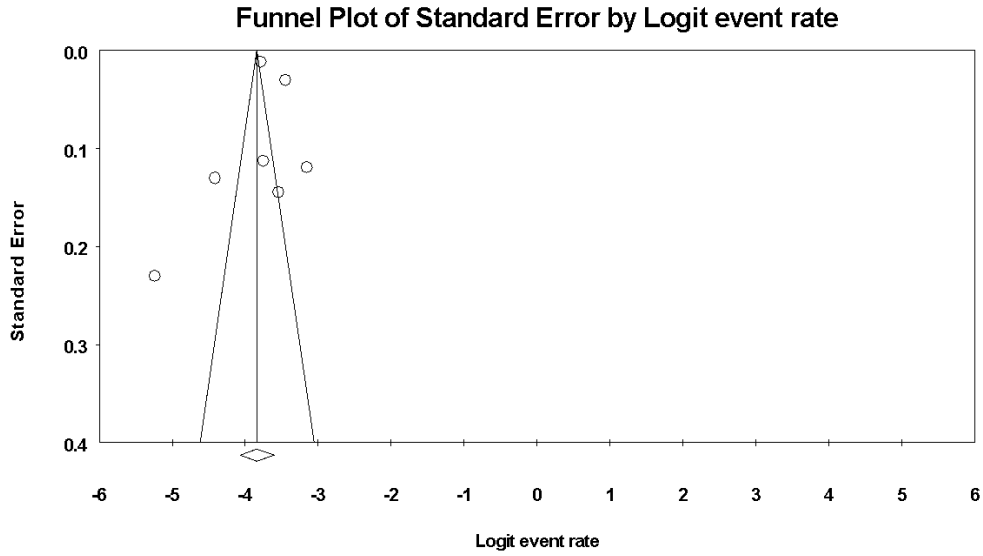

Fig-7: Funnel plot (males and females)

4- DISCUSSION

Cancer causes a crisis in the patient and the patient's family; this is why it is critical to pay attention to the prevalence of its occurrence (37). The prevalence of BT in male patients was 1.8% (95% CI, 1.4-2.3), in females it was 1.9% (95% CI, 1.5-2.3), and its total prevalence was 2.1% (95% CI, 1.7-2.7). To better compare, the studies reviewed on the prevalence of BT in patients are divided into two categories: patients under 18 years and patients in all age groups.

In the group of patients under 18 years of age, in the study of Hargreave et al., which examined 1,533,5990 patients, there were 725 children with CNS tumors, among whom 342 (47.2%) were girls, and the average age of the patients was 12.9 (38). Also, the status of Primary Intracranial Tumors was examined in some reports. For instance, in the study of Al Sheyyab et al., in Jordan, among people aged 0-14 years, the prevalence of BT was reported to be 18.8 Per 1000000 (39); in the study by Dreifaldt et al., in Sweden, in the age group of 0-14 years, NA was reported to be 1.6 (40); in the study by Makino et al., in Japan, among under-15-year-old participants, the amount of NA was reported to be 36.1% (41). According to the findings of the mentioned studies, the prevalence of tumors related to the CNS in people under 18 years of age has been reported to be 2.2%, (95% CI: 1.5-3.4). The results of this study indicate that the prevalence of tumors related to the CNS is significant. It is similar to people under 18 years of age in Iran.

Considering all age groups, Robles et al. in their meta-analysis, investigated the prevalence of BT in the world, finding an incidence rate of 10.82 (95% CI: 8.63-13.56) (42). In another study by Davis et alIn America, the incidence rate of BT was estimated as 13.8 per 100,000, with the prevalence rate of benign primary tumors as 29.5 and malignant tumors as 97.5 per 100,000 (43). Considering the important role of nervous system diseases, it is required to carry out necessary interventions for preventing them (44).

5- CONCLUSIONS

Although the prevalence of BT is not high, due to the important role of these types of tumors in determining the health status of patients, it is required to take the necessary measures including prevention and treatment in the fields of rehabilitation and Drug treatment.

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