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Prevalence of Epilepsy among Iranian Children and Adolescents: A Systematic Review and Meta-Analysis

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Abstract

Background: Epilepsy is known as a periodic and severe disturbance in the nervous system, resulting from abnormal discharge of brain cells. Epilepsy is characterized by unexplained seizures, and threatens human life throughout their entire life span. The prevalence of epilepsy is high in early childhood, and declines with the increase in age.

Method: In this study, a meta-analysis was done on the papers published from 2000 to 2023, investigating the prevalence of epilepsy within the age range of 1-20 years. Having a precise report of the studied city, report of prevalence as number or percentage, and report of epilepsy within the mentioned age range were the inclusion criteria for the papers. Any disagreement in fulfilling the criteria was resolved in a meeting by the presence of the three researchers. The search was done across Iranian databases plus ISI, Scopus, PubMed, and Embase with keywords of epilepsy, prevalence, children, adolescents, Iran, epidemiology, and psychiatric disorders.

Result: In the initial search, 1276 papers were found, 28 of which were selected after screening based on inclusion and exclusion criteria, and were analyzed via random method. The prevalence of epilepsy was found to be 2.3 (95%CI: 1.3-3.8). Its Z-value was -13.719, Q-value 2443.036, df (Q) 31, and I-squared 98.731.

Conclusion: The prevalence of epilepsy in Iran is 2.3 (95% CI: 1.3-3.8), which warrants the necessary measures to be taken for its reduction.

Key Words: Children, Epilepsy, Meta-analysis, Systematic review.

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1- INTRODUCTION

Seizure is a limited brain function impairing event, which occurs due to abnormal neuronal discharge. Seizures, especially their recurrent ones, are called epilepsy. Epilepsy is known as a periodic and severe disturbance in the nervous system, resulting from abnormal discharge of brain cells. Epilepsy is characterized by unexplained seizures, and threatens human life throughout their entire life span. The prevalence of epilepsy is high in early childhood, and declines with the increase in age (1-3). These patients experience complications such as disability, socioeconomic burden, social stigma, and mortality, which leave long-term complications. In some societies, social stigma, socioeconomic constraints, and misbeliefs of people (initiation of epileptic seizures due to curse, sorcery, etc.) are barriers against the control or treatment of epilepsy (4, 5).

There are around 32.7 million people with epilepsy worldwide, whose prevalence among children is 6 per 1000 in the US (6, 7).

Epilepsy causes complications for the patient including disability, sleep and quality of life disorders, socio economic problems, social stigma, psychological issues, and mortality which leave considerable long-term complications (8, 9). Also, these patients get abused through various discriminations regarding selection of occupation, education, marriage, or other fundamental rights in life (10, 11). Epilepsy manifests itself with motor system, autonomic system, as well as with behavioral disorders; and is a challenging process for the patient, family, healthcare team, and society (12).

In most cases, epilepsy has no specific reason, and genetic factors are involved in its incidence. In some occasions, epilepsy in children occurs due to diseases other than brain conditions such as infection, cranial trauma, metabolic disorders, high fever, hypoxia, gastroesophageal reflux, toxins, concussions, primary or metastatic tumors of the brain, cardiac arrhythmias, or brain vessel diseases (13-15).

Regarding the prevalence of epilepsy, some studies have been conducted; yet discrepancies are observed in their reported values. In the study by Pakdaman et al., it has been reported to be 18.8%, 10.8%, and 19.2% at age ranges of 0-4, 5-9, and 10-14 years, respectively (16); Ataei Nakhaei et al. reported 37.4% among people with the mean (SD) age of 36.25±42.51 months (17); Nachvak et al. reported 10.5% within the age range 6-18 years in Tehran (18). According to the mentioned statistics, the prevalence of epilepsy has been reported differently across various sample sizes, studied cities, and age ranges. As such, since the available statistics in this regard are discrepant, a study was done to explore the prevalence of epilepsy in Iran.

2- MATERIALS AND METHODS

In this study, a meta-analysis was done on the papers published from 2000 to 2023, investigating the prevalence of epilepsy within the age range of 1-20 years. Having a precise report of the studied city, report of prevalence as number or percentage, and report of epilepsy within the mentioned age range were the inclusion criteria for the papers. The cases of lifetime epilepsy or those with other types of seizures including febrile seizures were excluded.

The search was done by two researchers specialized in epilepsy and meta-analysis. Any disagreement in this regard was resolved in the presence of a third researcher, in a 3-person meeting. The search was done across Iranian databases plus ISI, Scopus, PubMed, and Embase with keywords epilepsy, prevalence, children, adolescents, Iran, epidemiology, and psychiatric disorders.

3- RESULTS

In the initial search, 1276 papers were found; after screening based on inclusion and exclusion criteria, 28 papers remained and were analyzed via random method (**Table 1**).

Using a random model, it was revealed that the prevalence of epilepsy was 2.3 (95%CI: 1.3-3.8). Z-value was found to be -13.719, Q-value 2443.036, df(Q) 31, and I-squared 98.731 (**Fig. 1**).

Based on the findings, Z-value in publication bias was -93.72610, and Even rate was 0.06154 (**Fig. 2**).

In a more recent article, the prevalence of epilepsy was found to be lower (Q=1699.52, P=0.000, I^2=98.76) (**Fig. 3**).

4- DISCUSSION

Children and adolescents experience various physical disorders. Some physical diseases are also associated with psychological health. The related psychiatric disorders are mental retardation, autism, and epilepsy. Children are the capital of any society, and their health is very important. Psychiatric disorders negatively affect the academic and professional performance of children; in case nursing, medical, and psychological interventions are not applied at the proper time, and serious problems arise for children during their education and in the rest of their physical life (48-52).

According to the findings, the prevalence of epilepsy was 23. (95%CI: 1.3-3.8). Epilepsy is a neurological disorder; in case its symptoms are not managed, it causes the development of psychiatric disorders for the patient. Through inducing depression, epilepsy can even breed the ground for suicide (53). According to Mirghaed et al. (49), the prevalence of psychiatric disorders was reported as 25.42%, in studies using clinical interviews, while in those that had applied screening tools, it was 31.03% (54).

In a meta-analysis conducted by Sayemiri et al. (2014), covering the overall population (all age ranges in Iran) with the sample size of 7723 between 2002 and 2019, the prevalence of epilepsy was found to be 1%, 5%, 4%, and 5% in north, center, east, and in total, respectively (55). The total prevalence of epilepsy in the study by Sayemiri has been more than twice as large as what reported in the present study. This difference can be attributed to the number of reviewed studies, as well as the age range of the participants. Also, according to the results of meta-regression, the publication year of the papers has been a criterion in determining the prevalence of epilepsy. In the present study, 38 papers were analyzed while the analysis by Sayemiri was conducted on nine papers, and the age range in the current study was limited to younger than 18 years, in studies published between 2000 and 2023.

In the current study, the prevalence of epilepsy was found to be 2.3 (95% CI: 1.3-3.8). Feist et al. in their study analyzed the findings of 222 papers; 197 papers related to prevalence and 48 dealing with incidence. The point prevalence was 6.38 and the lifetime value was 7.60 (56). Burneo et al., in Latin America, reported the total prevalence of epilepsy to be 17.8% and within the range of 6-43.2% (57).

In the study by Bruno, the prevalence of lifetime epilepsy was 15.8/1000 and active epilepsy was 10.7/1000 (58). The difference in epilepsy prevalence can be attributed to differences in the methods of data collection, type of instruments (examination, interview, etc.), mean age of patients, sample size, and the cultural characteristics of the examined society.

Table-1: Specifications of the articles

No.	Author (year of publication)	City	Years	Age	N			%		
					Girls	Boys	Total	Girls	Boys	Total
1	Nasiri et al (19)	Mazandaran	2019	6-18	534(50.8)	517(49.2)	1051	-	-	18(1.7)
2	Safavi et al (20)	Chaharmahal and Bakhtiari	2019	6-18	558(51.5)	525(48.5)	1038	-	-	38(3.5)
3	Amiri et al (21)	Tabriz	2017	6-18	539 (52)	497 (48)	1036	22 (2.2)	17 (3.4)	29 (2.8)
4	Hamadan et al (22)	Hamadan	2018	6-18	529(51.9)	494(48.4)	1020	-	-	10
5	Ebrahimi et al (23)	Kerman	2012	Under 9	101	119	220	3	3	6
				10-19	179	169	348	1	2	3
6	Talebi et al (24)	Tabriz	2014	0-10	-	-	574	-	-	1
				10-19	-	-	776	-	-	0
7	Ataei Nakhaei et al (17)	Mashhad	2021	36.25±42.51 months	111(61.67%)	69(38.33%)	180	22(32.8%)	45(67.2%)	67 (37.4%)
8	Mojahed et al (25)	Zahedan	2021	6-18	-	-	1003	-	-	25(2.5)
10	Riahi et al (26)	-	2022	6-18	-	-	1028	-	-	25(2.4)
13	Nachvak et al (18)	Tehran	2002		-	-	4131	234(12.78)	202(8.78)	436(10.5)
14	Karimzadeh et al (27)	Tehran	2010	M=8.4	49	45	94	23	20	43
15	Talepasand et al (28)	Semnan	2019	-	-	-	1037	-	-	2%
17	Ahsan et al (29)	Sannadej	2013	38.2±30.9 M	124	212	336	31(25)	64(30.2)	28.3%
18	Mohammadi et al (30)	-	-	6-18	-	-	33264	-	-	569(1.9)
19	Haghbin et al (31)	North Khorasan	2018	6-18	-	-	1010	-	-	47(4.7)

No.	Author (year of publication)	City	Years	Age	N			%		
					Girls	Boys	Total	Girls	Boys	Total
20	Khaleghi et al (32)	Tehran	2018	6-18	-	-	2095	-	-	40(1.9)
21	Amirian et al (33)	Kermanshah	2022	6-18	-	-	993	-	-	10(0.1)
22	Mowlavi et al (34)	Ardabil	2018	6-18	-	-	1035	-	-	36(3.5)
25	Mohammadi et al (35)	-	2021	6-18	-	-	29781	-	-	63(4.1)
27	Sarraf et al (36)	Qazvin	2019	6-18	-	-	1025	-	-	21(2)
28	Kian et al (37)	Zanjan	2020	6-18	-	-	1039	-	-	7(0.7)
29	Golbon et al (38)	Hormozgan	-	6-18	-	-	1005	-	-	7(0.7)
30	Ahmadi et al (39)	Yazd	2023	6-18	-	-	1035	-	-	10(0.1)
31	Mojahed et al (40)	Sistan and Baluchestan	2021	6-18	-	-	1003	-	-	25(2.2)
32	Kaheni et al(41)	Birjand	2011	6-18	-	-	2058	-	-	19(0.9)
33	Derakhshanpour et al (42)	Gorgan	2020	6-18	-	-	1025	-	-	22(2.1)
34	Armani Kian et al (43)	Zanjan	2020	6-18	-	-	1039	-	-	7(0.7)
35	Eslami Shahrbabaki et al (44)	Kerman	2020	6-18	-	-	1050	-	-	10
36	Kousha et al (45)	Rasht	2019	6-18	-	-	1024	-	-	25(2.4)
37	Mohammadzadeh et al (46)	Kurdistan	2018	6-18	-	-	1016	-	-	32(3.1)
38	Mohammadi et al (47)	East Azerbaijan	2013	6-18	-	-	1286	5	7	12

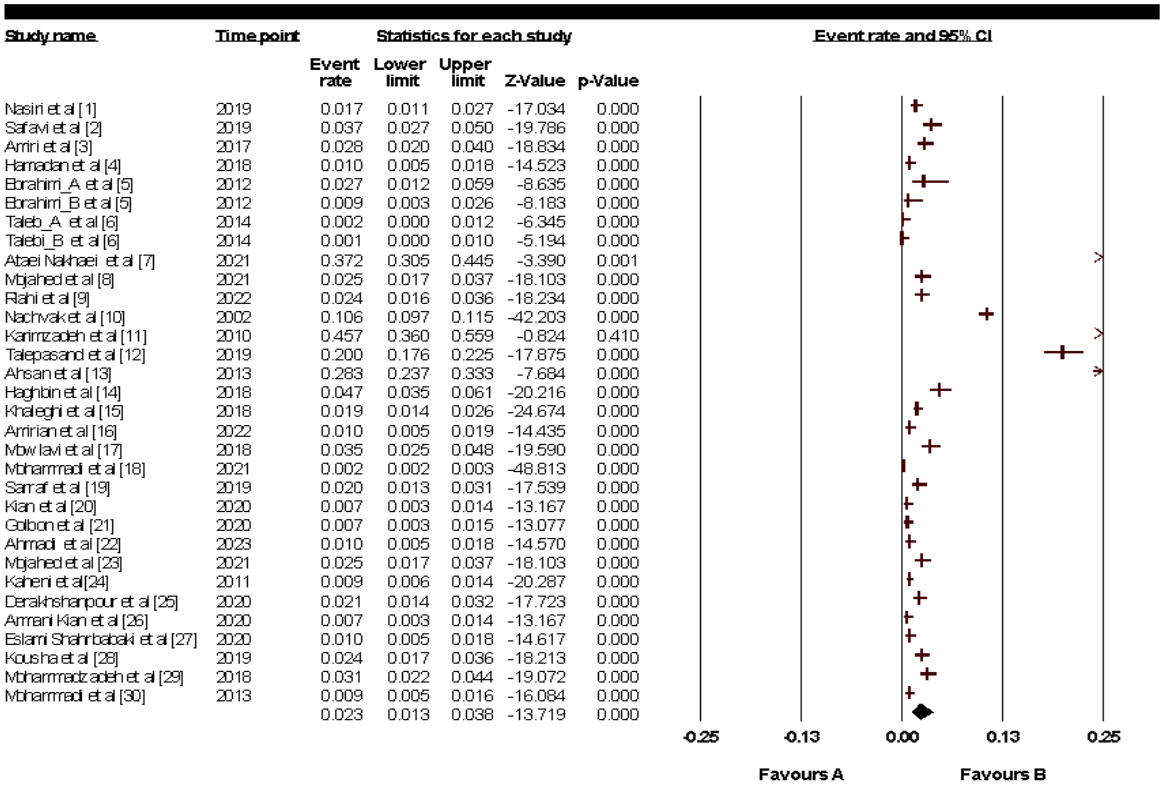

Fig. 1: Prevalence of epilepsy in Iranian children and adolescents

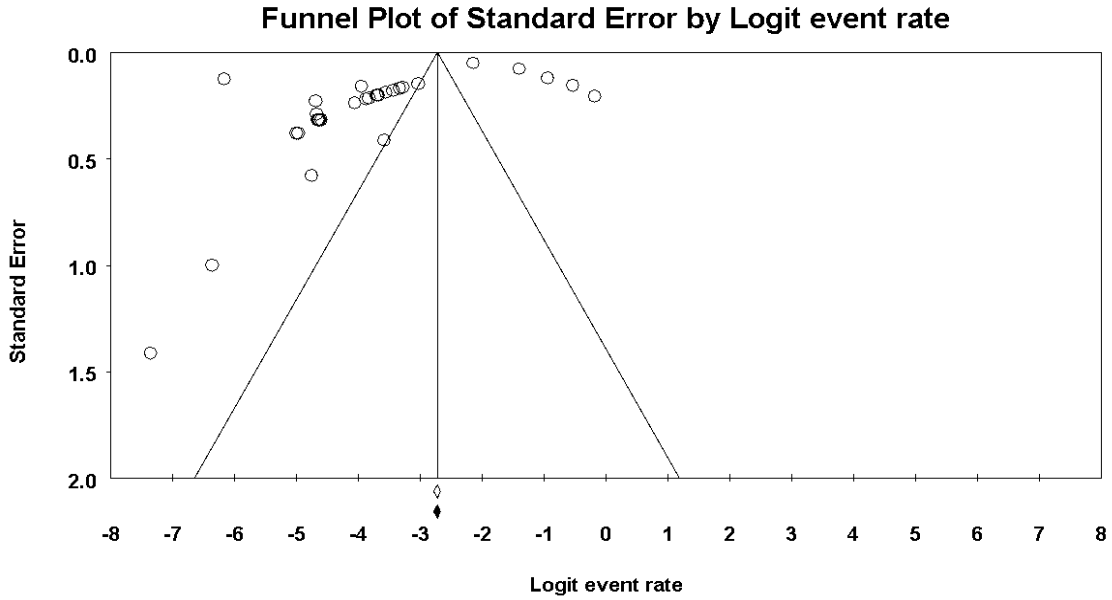

Fig. 2: Funnel plot for epilepsy

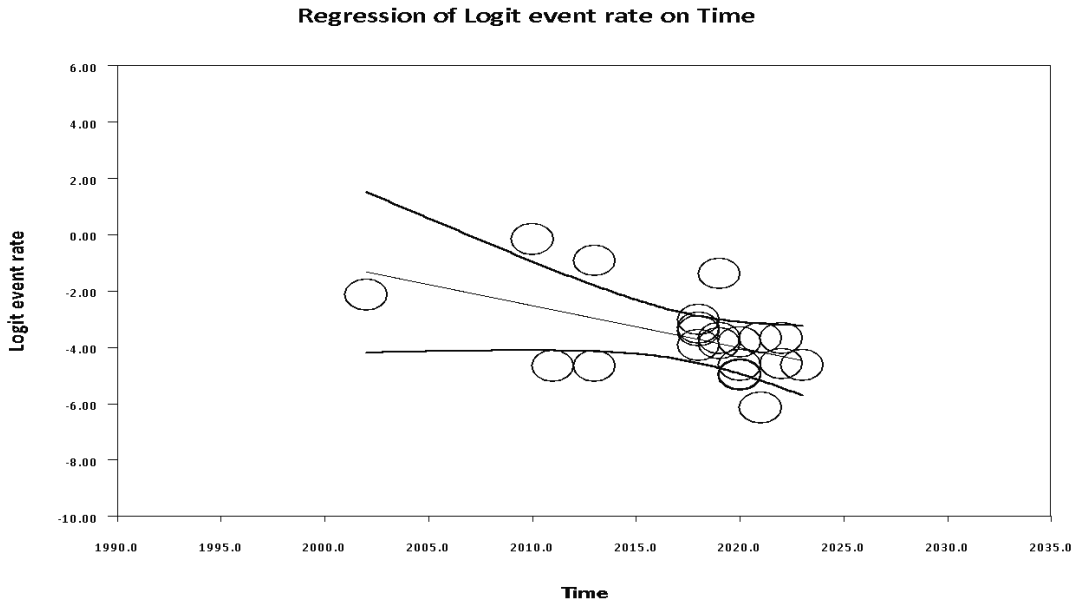

Fig. 3: Meta Regression diagram of the relationship between epilepsy prevalence and the publication year of the articles

5- CONCLUSION

The prevalence of epilepsy in Iran is 2.3 (95%CI: 1.3-3.8), which warrants the necessary measures to be taken for its reduction.

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