

Prevalence of Active Epilepsy in Kerman, Iran: a House Based Survey

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Abstract-

Purpose: Epilepsy is considered to be among the most prevalent neurological disorders and one of most important health issues. It costs huge expenses for health system, and influences the individual and social quality of life of the patients. Despite its importance, the studies conducted in Iran to determine the prevalence of epilepsy are limited. The present study evaluated the Prevalence of active epilepsy in Kerman.

Methods: The present cross sectional study was carried out on 2919 individuals from different neighborhoods of Kerman in two stages, first stage was screening process by trained questioners, and the second one was the confirmation of definite diagnosis. Cases of Inactive epilepsy were eliminated from the study. Questionnaires containing demographic information and paraclinical analyses were filled out for each individual. Also 628 epileptic patients in Kerman, who had referred to a referral center, were analyzed concerning epilepsy subtypes.

Results: From 126 suspicious individuals, 23 subjects were diagnosed to be epileptic. Point prevalence of active epilepsy was 7.87/1000 individuals. It was equal in both sexes, with a significant increase in individuals having low education ($P=0.029$). The generalized epilepsy had a higher frequency. Of the patients, 56.6% suffered from psychiatric diseases. Electroencephalography (EEG) in 13 patients (56.5%) showed epileptic waves. Family history of seizure was positive in 17.3% of the patients.

Conclusion: Point prevalence of active epilepsy is 7.87/1000 in Kerman, as same as developing countries. The prevalence was significantly higher in individuals with lower education.

Key Words: epilepsy, prevalence, Kerman, Iran, questionnaire

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INTRODUCTION

Epilepsy is one of the most common serious neurological problems and is occurred because of sudden, severe and intermittent disturbance of the nervous sys-

tem due to abnormal electrical activity of neurons⁽¹⁾. Seizures are broadly classified into generalized, partial, and unclassifiable types⁽²⁾. Partial seizures are also more classified into simple and complex forms according to the ability to disturbing consciousness⁽²⁾. Epilepsy is

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often accompanied with the decrement in the level of the consciousness, or abnormal motor, sensory or autonomic manifestations. Epilepsy influences the quality of personal and social life in the affected individuals. A part of this influence is caused by the physical effects of the seizures (such as physical injuries) or the frequency of seizures, and another part is the result of long-term use of medicines⁽³⁾. Depression, anxiety, employment restriction, and in uncommon circumstances death, are among the other adverse effects of seizures^(4,5,6). There are multiple causes for the epileptic attacks, and among these we can point to: head trauma, cerebral infections, tumors and cerebral infarctions. However at least in some patients the seizures are idiopathic⁽⁷⁾. Nowadays, numerous numbers of epidemiological studies are being carried out regarding the issue under discussion worldwide. Among the main objectives of these studies is to determine the prevalence of epilepsy in each and every region, which, equipped with accurate information, researchers are enabled to provide an appropriate infrastructure of diagnosis-treatment facilities. Since the factors which pave the way for exposure to epileptic seizures and their frequency are different in different societies (trauma for instance), another objective of epidemiological analyses concerning epilepsy is to help decrease the cases of epilepsy through regional epidemiological analyses, and recognition, elimination, or reduction of these risk factors^(8,9). Studies showed that in African countries the prevalence of epilepsy was between 0.2% to 5.8%⁽¹⁰⁾. Another studies showed that the least prevalence was in Ethiopia (0.5%) and the most was in Ivory Coast (5.8%)⁽¹¹⁾. Also studies in Europe showed the prevalence of 0.4% to 0.8%⁽¹²⁾. In one study in USA that information was collected from the 19 states the prevalence of 0.84% for this disease was observed⁽¹³⁾. In Asia various studies was done for this purpose. For example in different door-to-door studies, prevalence of active epilepsy was reported in India to be 0.39% and 0.77% in Laos. Whereas it was 1% and 1.07% in Pakistan and Vietnam respectively⁽⁸⁾. There are very limited published studies for the prevalence of epilepsy in Iran. Mohammadi et al in 2005 reported for the prevalence of 1.8% for epilepsy while studying the epidemiol-

ogy of psychiatric disorders in Iran⁽¹⁴⁾. In Khadivi et al article the prevalence of 0.22% was reported in Chaharmah and Bakhtyari province of Iran⁽¹⁵⁾. Unfortunately despite of epidemiologic importance of this subject, there is not accurate prevalence rate of epilepsy in Kerman province and other parts of Iran. Whilst with paying attention to the importance of this disease and preparing the health facilities for the treatment of this patients and community education, this matter appears more indispensable. According to the items stated above, the main goal of this study was the determination of prevalence of epilepsy in Kerman city. While also the abundance of different seizure subtypes were evaluated among 628 epileptic patients who came to a referral center in Kerman.

METHODS

In this population based cross-sectional study in Kerman city, ten different districts was selected randomly. A number of three major clusters were selected in each neighborhood (region), of which approximately 30 to 35 families were questioned referring to the clusters consecutively. All the members in every family went through screening.

Research team: Including 2 neurologists (organizers as well), 3 trained questioners, and an expert for uploading the information for analysis.

Screening tool: we adopted a questionnaire that was first used in an Ecuadorian study. That study was designed for evaluation of the prevalence of epilepsy by Placencia et al^(16,17).

This questionnaire was used in other studies in Brazil and Zambia^(18,19). The questionnaire was translated into Persian and we added more questions related to demographic characteristics.

We tested it before the beginning of the study in 40 subjects (20 with epilepsy and 20, without).

The performance of this pretest was sensibility 95% and specificity 72%. This questionnaire consisted of nine questions, both questions one and two must be affirmative to renders the subject positive and any question from three to nine renders the subject positive if it was

affirmative. The questionnaire was designed to identify all cases who suffered all types of epileptic seizures. The adults (subjects of 13 or older) were questioned directly, otherwise, a family member with comprehensive knowledge of the other members was asked to fill out the questionnaire according to the questioner's instructions. In the case of children we asked their parents to fill the questionnaire. In our study active epilepsy was defined according to the ILEA definition which included the patients who had seizure attack in the last 5 years, or were taking antiepileptic drugs (AEDs) at the time of study⁽²⁰⁾.

Study Design

The present study was conducted in two stages. The first stage took from late November 2010 to late May 2011, in which three trained questioners screened all the members of every family using standard screening questionnaires. Second stage: those subjects considered to be positive, eventually underwent examination for further analysis, including EEG and cerebral imaging (if necessary) by 2 neurologists for definite epilepsy diagnosis.

Examination by neurologist: those considered positive in the screening were interviewed by 2 neurologists, conducted either on the phone or personal. In suspected cases we also interviewed relatives or witnesses of the attacks. Neurologists used the standard criteria in the ILEA for epilepsy. EEG was done in difficult cases or in subjects who EEG had not been done. EEGs with spike or sharp waves were considered epileptic and instances with non-epileptic EEG changes (e.g. slowing) were grouped as abnormal (nonspecific EEG changes). Brain imaging (CT/MRI) was done when it was necessary or it was searched in the patient's medical records. Information about taking or not taking the AEDs and family history of epilepsy in first degree relatives was also collected (first group).

For better evaluation of the redundancy rate of different seizure subtypes, we studied 628 epileptic patients who were referred to a referral center in Kerman city. These subjects were all lived in Kerman at the time of the study) second group)

STATA 11 software was employed for analysis of

data according to the age, sex, and education. The main variables were initially described in general, and after that we compare the groups with chi-square test.

RESULTS

A total of 2919 individuals (1426 male 1493 and female) went through screening in our survey. Of the 2919 screened individual, 239 individuals were considered suspicious, of which 101 individuals were eliminated after phone interviews by neurologists due to lack of seizure-based history. The remaining 138 subjects were invited for personal interviews and the required examinations, of which 12 subjects withdrew from the study. From the remaining 126 subjects (who experienced epileptic seizure at least once in their lives), 23 subjects were definitely diagnosed with active epilepsy subsequent to complementary questions, examining of the patients' medical records, and EEG (if necessary). The patients were comprised of 12 men (52.1%) and 11 women (47.8%). Table 1 shows the age- and gender-specific prevalence rates of adult patients with active epilepsy in this study. Generalized tonic clonic epilepsy was seen in 56.5% of patients and 39.1% had focal epilepsy. (First group in table 2) No significant difference was observed between the two sexes ($P > 0.05$). Epileptic patients had lower education compared to non-epileptic individuals and the difference between the two groups of healthy and patient was meaningful ($P = 0.029$).

A number of 13 patients (56.6%) had history of neuropsychiatric disorders with depression being the most prevalent case (21.7%). Records from 18 patients (78.2%) showed treatments with antiepileptic drugs, while 5 patients (21.7%) did not mention any history of medicine use. EEG showed epileptic discharges in 56.5% of the cases, 30.4% portrayed non-specific changes, and for 13% of the patients EEG was absolutely normal. Imaging results of CT/MRI was normal for 11(73.3%) of the cases, while 4(26.6%) cases showed abnormal results. The remaining 8 patients did not undergo imaging for disparate reasons. Familial epileptic history was positive in 17.3% of the cases.

As observable, table 3 shows the comprehensive

Table 1. The prevalence rate (per 1000) of patients with active epilepsy in Kerman, Iran

Age(year)	Kerman population			Number of active epilepsy (prevalence %)(95% CI)in Kerman		
	Men	Women	Both sex	Men	Women	Both sex
Under 9	119	101	220	3 (25.2)(17.66-27.74)	3 (29.7)(24.4-35.0)	6(27.3)(23.1-31.6)
10-19	169	179	348	2(11.8)(9.7-13.9)	1 (5.6)(4.4-6.8)	3(8.6)(4.44-12.76)
20-29	345	385	730	0	4 (10.4)(6.6-14.1)	4 (5.5)(1.1-9.6)
30-39	276	298	574	2(7.2)(5.1-9.3)	0	2(3.5)(2.0-5.0)
40-49	138	138	276	2 (14.5)(12.4-16.6)	2(14.5)(12.4-16.6)	4 (14.5)(12.4-16.6)
50-59	168	183	351	1(5.9)(5.5-6.3)	0	1(2.8)(2.4-3.4)
60-69	150	131	281	1(6.7)(6.1-7.3)	0	1(3.5)(2.1-5.9)
Upper 70	63	78	141	1(15.9)(10.7-21.1)	1(12.8)(7.6-17.9)	2(14.2)(8.8-19.7)
Total	1426	1493	2919	12(8.4)(4.6-12.2)	11(7.4)(3.6-11.2)	23(7.9)(4.5-11.3)

Table 2. Frequency of different types of epilepsy among our patients

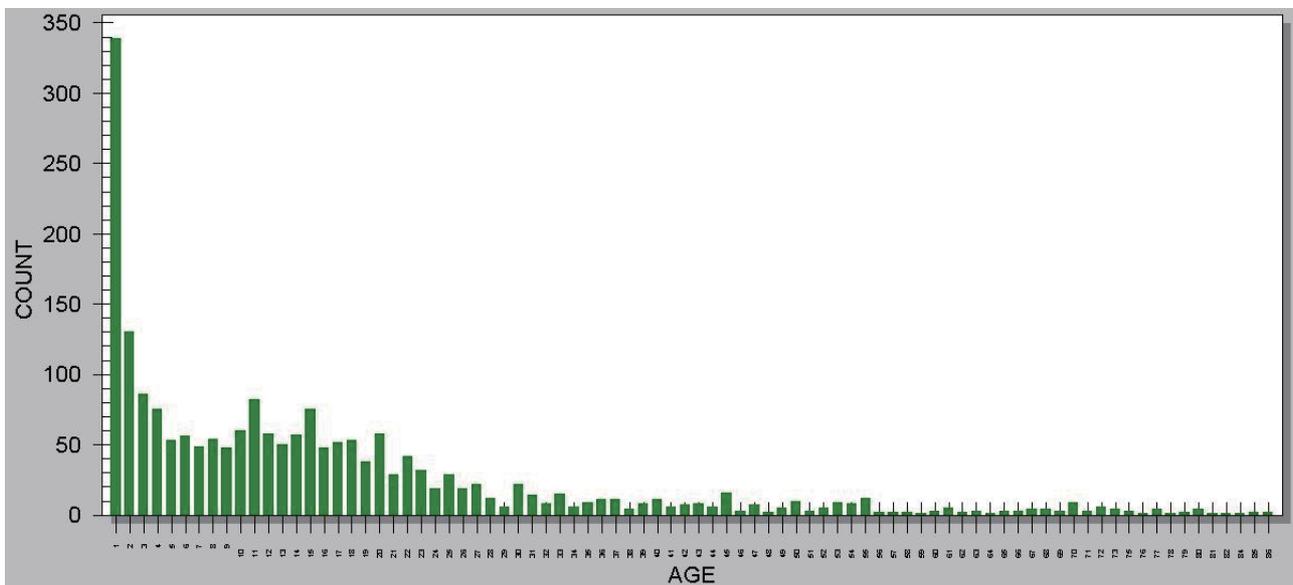
Seizure type	First group	Second group
generalized	56.5%	51.1%
focal	39.1%	44.1%
unclassifiable	4.3%	4.8%

First group: Patients from our house-to-house survey

Second group: Patients from the referral center

results of the analyses on epileptic patients concerning medicine use, familial history, imaging findings, EEG, and incidence of psycho-neurological diseases.

Furthermore, the medical records pertaining to 628 patients of a referral center in Kerman were also investigated in an attempt to determine more accurately the different subtypes of seizure for patients in Kerman (Table 4). All the mentioned patients were residents of Kerman within the time period of the study. Of these, 321 patients (51.1%) suffered from generalized seizures and



Graph1: Distirbion of age of epilepsy onset

Table 3. Characteristic data in epileptic patients.

		Frequency	%
History of Neuropsychiatric disorders	No	10	43.3
	Yes	13	56.5
Type of Neuropsychiatric disorders	Depression	5	21.7
	Anxiety	4	17.3
	Mental		
	Retardation	2	8
	Hyperactivity	1	4
	Migraine	1	4
History of AEDs consumption	Yes	18	78.2
	No	5	21.7
Causes of not using AEDs	Limited knowledge regarding the disease	3	60
	Lack of faith in treatment	1	20
	Low of financial ability	1	20
EEG	Normal	3	13
	Non-Specific changes	7	30.4
	Epileptic	13	56.5
CT/MRI	Normal	11	73.3
	Abnormal		
	Cortical atrophy	2	13.3
	Old Stroke	1	6.6
	Mesial Temporal Sclerosis	1	6.6
	Total	4	26.6
Family History	Positive	4	17.3
	Negative	19	82.6

277 (44.1%), from focal seizures. (Second group in table 2)The highest rate of epilepsy affliction was dedicated to the first year of life. The foregone rate gradually declines up to adolescence and portrays a much smaller peak in the 7th decade of life (Graph 1). The number of male patients was, again, more in this group; the difference, however, was not significant. Also the causes of epilepsy were studied in this group of patients, and the results are shown in table 5.

DISCUSSION

Almost 65 million individuals are suffering from epilepsy worldwide⁽²¹⁾. Population-based epidemiologi-

cal studies on epilepsy are considered to be significantly important, since their results are broadly influential in determining preventive policies and providing medical and diagnostic measures. Following similar objectives, the present population-based study investigated the prevalence of epilepsy and a number of its governing factors in Kerman. The conducted investigations showed that the point prevalence of active epilepsy in Kerman is 7.8/1000 individuals. Studies across the world have reported different statistics. The incidence rate of epilepsy is reported 2.6 to 3.8 individuals per one thousand in Argentina^(22,23), 1.5 to 4.5 in China^(24,25), 3.8 in India⁽⁸⁾, and 0.8 to 8.5 in Turkey^(26,27). Studies in Arab countries show various results from 0.9 individuals per one thousand in

Table 4. Frequency of epilepsy subtypes in epileptic patients

	SEX			
	Women		Men	
	Frequency	%	Frequency	%
Primary generalized tonic clonic	125	41.3	120	36.8
Secondary generalized tonic clonic	59	19.5	108	33.1
Atypical petitmal	5	1.6	10	3
Complex Partial Seizure	22	7.2	24	7.3
Focal Seizure	6	2	4	1.2
JME (Juvenile myoclonic epilepsy)	29	9.6	10	3
Lennox-Gastaut Syndrome	5	1.7	3	0.9
Petitmal (Typical)	1	0.3	2	0.6
Simple partial Seizure	5	1.7	1	0.3
Atonic	4	1.3	5	1.53
Tonic	11	3.6	4	1.2
West Syndrome	2	0.7	0	0
Focal Seizure with secondary Generalization	15	5	18	5.5
Complex Febrile Seizure	13	4.3	17	5.2
Total	302	100	326	100

Table 5. Age-specific etiologies of active epilepsy in Kerman, Iran

Age	Cerebral Palsy	Vascular	Head injury	Tumors	Others	Total
First year	28	0	0	0	10	38
2 — 10	21	2	1	1	9	34
11 — 20	9	1	6	1	5	22
21 — 30	1	0	12	4	4	21
31 — 40	0	3	8	1	3	15
41 — 50	0	6	3	0	0	9
51 — 60	0	6	2	2	1	11
61 — 70	0	9	0	1	0	10
> 70	0	7	0	2	0	9
Total	59(34.9%)	34(20.1%)	32(18.9%)	12(7.1%)	32(18.9%)	169(100%)

Others included: Febrile convulsions, CNS Infections, Metabolic Disorders, Drug abuse and Multiple Sclerosis

Sudan to 6.5/1000 in Saudi Arabia⁽²⁸⁾. A study by Mohammadi et al. reported prevalence of epilepsy in Iran to be 18/1000⁽¹⁴⁾. It seems that prevalence of epilepsy in developing countries is twice compared to that of developed countries⁽²⁹⁾; the statistics in these countries, however, are different as well. As indicated by different studies, incidence of epilepsy in European countries is

close to each other and ranges from 0.4% to 0.8%⁽¹²⁾. A study of epilepsy in the US, investigating subjects from 19 states, showed the incidence of 0.84%⁽¹³⁾.

Thurman et al stated that since different studies have employed various media for sampling, the results cannot be compared properly; thus there is a need to standardize the epidemiological studies on epilepsy⁽²¹⁾. The foregone

different media include total population, population of schools, hospital referrers, or even special needs schools⁽³⁰⁾. The manner of diagnosis of epilepsy is undoubtedly influential in these studies as well, and affects the results based on whether the patient him/herself has reported or is examined by a physician⁽²⁹⁾. The present study attempted to heighten the accuracy by the measures explained in the methodology (house to house investigation as well as approval of diagnosis by specialists).

In our study the results showed no meaningful difference between sexes. However different studies revealed various results. Studies conducted in England⁽³¹⁾, Singapore, Italy, India, and Sweden, similar to the present study, reported no sex domination i.e. the difference between male and female was small, while in Taiwan, China, Turkey, Finland, and Estonia, men had dominance and in Pakistan and Nepal women were dominant^(8,12,32).

Concerning changes in the EEG, 13% of the cases were normal, while the rest showed epileptic or non-specific changes. In an epidemiological study in India, Panagariya et al. observed that 15% of the subjects maintained normal EEGs which were almost similar to our results⁽³³⁾. In another study in Japan, however, 59.5% of the cases showed epileptic discharges⁽³⁴⁾.

Concerning imaging, 26.6% of the patients of this study showed abnormal findings while in the study of Panagariya et al., imaging changes were observed in 66.5% of the cases⁽³³⁾. And in Japan 27.4% of the cases had changes in CT/MRI⁽³⁴⁾. The method of imaging (MRI or CT) is effective in the resulting statistics however.

The results of this study indicated a significant difference between epilepsy prevalence and the level of education i.e. the incidence of epilepsy was higher in individuals with lower education, that can be attributed to the presence of cerebral palsy or head injury among these patients which can lead to many problems in their education, This finding conforms to studies carried out in the US⁽¹³⁾, Vietnam⁽³⁵⁾, and Turkey⁽³⁶⁾. But Ferro observed no such relationship in England⁽³¹⁾. In a study in Taiwan, Chen et al. had found that the presence of

epilepsy was not significantly affected by socioeconomic status⁽³⁷⁾.

Positive familial history of epilepsy in blood relatives of the patients was 17.3% in this study which was close to some studies. For example in Turkey, positive familial history was seen in 14.3% of patients⁽³⁶⁾. Also in another study in Tanzania, A family history of epilepsy in first-degree relatives was found in 46.6% of patients⁽³⁸⁾. Etiology of this various findings isn't clear, maybe it is an incidental finding, or maybe it is related to other factors which must be investigated further .

Rate of the patients using antiepileptic medicine was 78 % in this study. The same rate was 83.9% for adults in a study in the US⁽¹³⁾ and 89% in a study in Turkey⁽³⁶⁾. About 60 % of these individuals stated that unfamiliarity with the symptoms of the disease and not visiting physicians as the reasons for not taking medicine which highlights the necessity for more planning and education regarding the importance of epilepsy and its symptoms.

According to previous studies the most common psychiatric disorders in epileptic patient were depression, anxiety and psychosis⁽³⁹⁻⁴³⁾. In the present study, in general, 56.5% of the patients mentioned psycho-neurological disorders, with depression being the most observed disorder with 21.7%. The combination of depression and anxiety was observed in 39% of the patients. In a study conducted in the US in 2007 however, the most prevalent psychologic disorder, anxiety, was reported as 22.8% and the combination of depression and anxiety as 34.2%⁽³⁹⁾.

In the conducted analyses on 628 referred epileptic patients, notwithstanding the higher incidence in males, no significant difference was observed concerning sex which concurred the previous findings.

In this study, generalized seizure was the most common subtype, a few studies are consistent with this finding⁽⁴⁴⁾, but in most of the previous studies, the complex partial seizure was the most common seizure subtype⁽³²⁾.

The excess of generalized seizure in our findings is maybe partially due to high rates of trauma and drug abuse (others in table 5) which can mostly lead to generalized seizure, whilst in our country it is possible that the complex partial seizures is underreported because of

stigma that exists in Asian countries to the psychiatric or other unusual manifestations of complex partial seizures⁽³⁷⁾.

The rate of male patients suffering from secondary generalized epilepsy was 64.6% which may be due to occupational traumas or accidents to which men are more exposed ($P < 0.001$). Another point to be mentioned is that JME (Juvenile myoclonic epilepsy) was more observed in females ($P = 0.006$) which may be caused by the replacement of childhood absence by JME in older ages, being more common in girls. It may also be due to genetic causes in Iranian population, since another study in Iran (Isfahan) reported increased incidence of JME in girls compared to boys⁽⁴⁵⁾. The foregone issue calls for further research.

In our study 26.9% of epileptic patients had identifiable cause, which is slightly different from other studies in Tanzania, 34%⁽⁴⁶⁾, Nigeria, 34.9%⁽⁴⁷⁾ and Taiwan where in the study by Chen et al., 35.1% of the patients had identifiable causes⁽³²⁾. This difference could be caused by using different paraclinic methods in various studies.

The most common causes of epilepsy in children are cerebral palsy (CP) and febrile convulsion (FC). High rates of CP in Iran are due to peripartum injury. Our findings about FC are correlated with other studies in Tanzania and Nigeria^(46,47). In adults head injury is the most common cause of epilepsy as with study in Taiwan by Chen et al. in 2006⁽³²⁾. In old age vascular events is the major cause of epilepsy which is consistent with previous findings⁽⁴⁸⁾ (Table 5).

In conclusion, our findings show that point prevalence of active epilepsy is 7.87/1000 in Kerman. This prevalence is as same as developing countries and was higher in patients with low education.

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