Original Article

The seizure recurrence rate in epileptic patients following universal health coverage: A time-series study

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Abstract

Background: Epileptic patients (EP) should be free of seizure recurrence (SR). Universal Health Coverage (UHC) was implemented in 2005 in Iran, aiming to tackle obstacles in front of health services' utilization. This study was done in order to assess the SR rate in EP after UHC implementation.

Methods: This study was a prospective time series that was done in rural areas of Falavarjan district in Isfahan province in central Iran from March 2016 to March 2017. 245 patients who suffering from any type of epilepsy and whom epilepsy confirmed by a neurologist, registered. All epileptic patients monitored continuously every month through the study, and the signs or symptoms attributed to the suspected seizure were assessed and referred to a physician for additional assessment and consultation to improve treatment compliance.
The patients' data about their demographic characteristics, type of epilepsy, any SR attack, and their risk factors were gathered from their self-files based on the checklists.

Results: Despite treatment schedules that were carried out for all EPs, during one year follow up, however, 37 (15.1%) patients displayed SR attacks. 19 (7.75%) patients who suffered RS were male with the mean age of 40 ± 13.5 years, without gender statistical difference (P=0.810). In patients who had RS, the main causes of lacking adherence to their treatment were forgetting to take medicines in 10 (55.6%), poverty in 3 (16.7%), and lacking motivation in 2 (11.1%) EPs.

Conclusion: Following UHC implementation in the primary health delivery system, that neuropsychiatric health packages were integrated, the incidence rate of SR attack in EPs was low.

Introduction

The point prevalence of active epilepsy is 6.38 per 1,000 persons (1). While 1.2% of Iranian inhabitants were suffered from epilepsy (2), epilepsy is ranked as the 15th disease that imposes a high burden to the Iranian populations (3).

Identifying the risk for seizure recurrence (SR) in epileptic patients (EP)s is necessary for making decisions about treatment. Nevertheless, several patients experienced relapse despite treatment (4).

Demographic characteristics such as age, gender, positive family history, and seizure characteristics, including status epilepticus or myoclonic episodes have all been recognized as risk factors for SR. Many seizures are provoked due to drug withdrawal, while low access to visit by health care providers or adequate medications play important roles (5).

Mental health disorders and epilepsy have been integrated horizontally as neuropsychiatric health program in primary health delivery system in Iran (6), and every health staff from the first level of service delivery that has close contact to the community to specialized services, have stressed on education, screening, improving patients' compliance on sufficient treatment, referring for receiving additional needed services, and follow up. The main diagnostic measurements have introduced by psychiatrists and neurologists (7).

The first phase of health sector reform has implemented in Iran in 2005 via universal health coverage (UHC) approach (as family physician program), aiming to facilitate access to essential health services and tackle obstacles in front of health services' utilization in rural areas and small cities (lower than 20 thousand people) (8).

Now, 14 years following UHC implementation, we decided to evaluate the SR rate in EPs in a rural community (rural inhabitants of Falavarjan district) in Isfahan province.

Methods

This study was a prospective time series that was done on epileptic patients, who stayed in rural areas of Falavarjan district (in Isfahan province in central Iran) from March 2016 to March 2017. There are 23 distinct districts in Isfahan province. Some rural areas' inhabitants in Isfahan district, receive health services from specialists directly. So we had to select the Falavarjan district, which is the nearest district to Isfahan city (center of the province) that its health delivery system in rural areas represents other rural areas of the province.

The Falavarjan's rural inhabitants were 83501 at the end of 2015. At the beginning of 2016, 250 epileptic patients had been registered in rural areas of Falavarjan district. They met the inclusion criteria and were entered into the study.

Inclusion criteria included all patients suffering from any type of epilepsy (with a history of unconsciousness, or abnormal tonic or colonic motion of extremities or upward gaze) with abnormal Electro-encephalogram (EEG) and MRI findings whom epilepsy confirmed by a neurologist, and they have resided in rural areas of Falavarjan through the study period registered and covered by family physician team. Exclusion criteria included EPs who migrated through the study period and no consent for participation in this study.

Every family physician team including one general practitioner and one nurse or midwife, and at least one expert in public health were responsible to encounter essential health services for 4500 inhabitants based on benefit packages referring to each age group in the community. In the family physician program, the payment system launched by capitation for general practitioners and other experts in their team. In rural areas and small towns, visits, and medications for EPs deliver free of charge at the family physician unit (9).

Following training the family physicians' teams in rural health centers in Falavarjan, all EPs monitored continuously every month along with 2016 to March 2017, and the signs or symptoms attributed to the suspected seizure were assessed and referred to a physician for additional assessment and consultation for sufficient therapy and/or improve treatment compliance.

After the integration of the neuropsychiatric health program, the data from each health house and health post were collected in health centers, and the data from the health centers were monthly sent to the mental health unit located in the district health network.

Table 1. Demographic variables of epileptic patients in rural areas of Falavarjan district (n=245)

Variable		Mean ± SD or n (%) [§]
Age (Years)		35.89 ± 16
Weight (cm)		65.39 ± 20.97
Height (cm)		157.58 ± 22.54
Age of first seizure (Onset)		15.12 ± 15.4
Age of last seizure		29.31 ± 15.78
Last seizure (Numbers of Years before)		5.05 ± 4.57
Gender	Male	119 (48.6%)
	Female	126 (51.4%)
Job	Housekeeping	98 (40%)
	Student	34 (13.88%)
	Business man	25 (10.2%)
	Others	88 (35.92%)
Education	Illiterate	58 (23.6%)
	Primary school	96 (39.2%)
	Secondary primary school	47 (19.2%)
	High school	40 (16.3%)
	University	4 (1.6%)
Consanguinity	Yes	33 (13.5%)
	No	212 (86.5%)
Fathers' education	Illiterate	114 (46.5%)
	Primary school	97 (39.4%)
	Diploma	31 (12.7%)
	BSc	2 (0.9%)
	MSc	1 (0.5%)
Fathers' job	Business man	67 (27.5%)
	Farmer	60 (24.3%)
	Worker	60 (24.3%)
	Others	58 (23.9%)
Mothers' education	Illiterate	143 (58.3%)
	Primary school	75 (30.6%)
	Diploma	25 (10.2%)
	BSc	2 (0.9%)
Mothers' Job	Housekeeper	224 (91.4%)
	Carpet Weaving	9 (3.6%)
	Motherless orphan	12 (5%)
Seizure Type	Tonic-Colonic	200 (81.8%)
	Petite mal	43 (17.4%)
	Complex Partial	2 (0.8%)
Family History	Yes	57 (23.1%)
	No	188 (76.9%)
Currently on treatment	Yes	228 (92.9%)
	No	17 (7.1%)
Resource of getting information on seizures (more than one could be chosen)	Television and radio	8 (3.3%)
	Specialist	151 (62.1%)
	Family physician	109 (44.7%)
	PHC provider	76 (31.3%)
	Newspaper and Journals	2 (0.8%)
	Books	0 (0%)
	Acquaintances	19 (7.8%)
	Others	3 (1.2%)

[§] Quantitative variables were reported as Mean ± SD and qualitative reported as number (percent)

The mental health unit was responsible for collecting, analyzing, assessment, performing reports, and feedback to health centers for improving the quality of neuropsychiatric care.

The patients' data about their demographic characteristics, history, type of epilepsy, any SR attack, and their risk factors, and the last treatment schedules were gathered from their self-files based on the checklists. The obtained data from patients' files analyzed by SPSS 16.0 software using the Mann-Whitney-U test, chi-square, and T-test.

The Research and Ethics Council of Isfahan University of Medical Sciences approved the study (No: 393096). The patients were informed about the study objectives and protocols and the written informed consent was obtained from patients or their families. Patients' information was kept confidentially through the research, analysis of the data, and publishing the results. Participation in the study was free of charge.

Results
245 out of 250 epileptic patients fulfilled the study and completing checklists (participation rate= 98%). The prevalence rate of epilepsy in such a population was 3 per one thousand populations approximately. 126 (51.4%) of EPs were female. Their mean of age was 35.89 ± 16.007 years old. Tonic-colonic seizures and Petit-mal seizures were experienced in 81.8% and 17.4% of patients respectively (Table 1).

Despite treatment schedules that were carried out for all EPs, during one year follow up (from 2016 to 2017), however, 37 (15.1%) patients displayed SR attacks, and 80 seizure attacks were reported for these patients (2.16 seizure attacks per patient who suffering RS). 19 (7.75%) patients who suffered RS were male with the mean±SD age of 40 ± 13.5 years. In patients who had RS, the main causes of lacking adherence to their treatment were forgetting to take medicines in 10(55.6%), poverty in 3(16.7%), and lacking motivation in 2(11.1%) of EPs (Table 2).

There was a significant direct correlation between the number of SR attacks and the age at last seizure. Similarly, a significant positive association was seen between the existence of SR and age at last seizure (table 3).

Table 2. Description of recurrent seizure attacks in 37 epileptic patients in rural areas of Falavarjan district in 2016-2017

	Number of attacks	Number of epileptic patients (%)
Number of recurrence seizure attacks	1	18 (48.6%)
	2	8 (21.6%)
	3	6 (16.2%)
	4	2 (5.4%)
	5	1 (2.7%)
	6	0 (0%)
	7	1 (2.7%)
	8	1 (2.7%)
Physician Visit after seizure attacks	Yes	56 (70%)
	No	24 (30%)
Place of Reference after seizure attacks	Family physician Team	46 (57.2%)
	Specialist	30 (37.5%)
	Emergency department of City Hospital	4 (5.3%)
Change in Antiepileptic drugs (AEDs)	Yes	46 (56.9%)
	No	34 (43.1%)
Type of AED change	Adding another drug	22 (47.4%)
	Increasing dosage	17 (36.8%)
	Changing drug	7 (15.8%)
Drug Adherence	Yes	67 (83.8%)
	No	13 (16.2%)
Cause of lacking adherence	Forgetting	10 (55.6%)
	Poverty	3 (16.7%)
	Lacking motivation	2 (11.1%)
Additional problems (in spite of adherence)	Stress	13 (36.1%)
	Lack of adequate sleep	10 (27.8%)
	Mental Retardation	3 (8.3%)

Table 3. Description of associated factors that displayed on seizure recurrence in epileptic patients in rural areas of Falavarjan district

Variables		Recurrence		P	OR (95% CI)
		No	Yes		
Age		35 ± 16.24	40 ± 13.51	0.095§	1.021 (0.999- 1.045)
Gender	Male	100 (40.82%)	19 (7.75%)	0.810†	0.917 (0.452 – 1.861)
	Female	108 (44.08%)	18 (7.35%)		
Job	Housewife	84`(34.3%)	14 (5.7%)	0.150†	1.021 (0.992-1.051)
	Student	32 (13%)	2 (0.8%)		
	Business Man	23 (9.39%)	2 (0.8%)		
	Others	69 (28.2%)	19 (7.7%)		
Education	Illiterate	46 (18.7%)	12 (4.9%)	0.566†	0.771 (0.536 – 1.11)
	Primary school	83 (33.9%)	13 (5.3%)		
	Secondary school	40 (16.3%)	7 (2.85%)		
	High school	35 (14.3%)	5 (2%)		
	University	4 (1.6%)	0 (0%)		
Seizure type	Tonic-Clonic	167 (68.2%)	33 (13.47%)	0.480†	0.551 (0.191 – 1.588)
	Petit mal	39 (15.9%)	4 (1.6%)		
	Complex partial	2 (0.82%)	0 (0%)		
Weight		64 ± 20.35	72 ± 22.96	0.059‡	1.020 (1.001 – 1.039)
Family history	Yes	47 (19.2%)	10 (4.08%)	0.377†	0.694 (0.308 – 1.565)
	No	161 (65.71%)	27 (11.02%)		
Age at last seizure		28 ± 15.68	37 ± 13.65	0.002* §	1.040 (1.016 – 1.066)
Last seizure (number of the years before)		6 ± 4.63	1 ± 0.76	<0.001* §	0.153 (0.071 – 0.329)

§ Mann-Whitney-U test
† Pearson chi-square
‡ independent t test
*$P<0.05$

Discussion
In the present study, the rate of SR attack in EPs was 15.1%. It has been indicated that the 5-year SR attack in children was around 42%, and it was approximately 30% after a first generalized tonic-clonic seizure. For the idiopathic generalized seizure with spike-wave discharges on EEG or symptomatic seizures, the risk of SR can be increased to 50% (10). According to another systematic review and meta-analysis in 2014, SR occurred in 46% of the patients, and 9% of them had seizures in their last year of the follow-up (11). Different results of incidence in these studies can be possibly due to the differences in study design and the selected criteria. However, the rate of SR attacks in EPs in the present study was less than in other studies.

Iranian health delivery system is well organized in the rural area. Unlike the urban areas, (in which primary health services are delivered in the passive routes), in rural areas, most of the primary health services are provided actively and the health staff members have close contact with the covered population and are responsible for

follow up them to utilize health benefits packages according to their age, sex, and any predisposing factors (6). It seems following UHC implementation, the obstacles (as geographical, physical, and economical) for deprived inhabitants have been reduced and EP have utilized neuropsychiatric services sufficiently and SR attacks are low.

In the present study, a family history of epilepsy is the most important predictor of SR attack. Similar to our study, Syed Rizvi.et al. and Lamberink HJ et al. reported that a history of epilepsy can be regarded as a definite risk factor for SR (10,11). Furthermore, the risk of SR in patients with a history of seizure in siblings, the history of complex febrile childhood seizure and spike, and wave abnormalities in EEG was higher than other patients (10-12).

In our study, SR was more observed in older patients (those who were in their thirties and forties). However, in other studies, patients younger than 12 years and over 59 years had a higher risk of SR (11, 14).

The prompt attention to epileptic children by their families supported by the family physician team can play a significant role in reducing SR in children, however, more studies in the future are needed to clarify these differences.

In our study, there was no significant association between the type of seizure and risk of SR, which is consistent with the results of Syed Rizvi.et al. study (10). In contrast with these findings, in other studies, the rate of SR was higher in the absence and myoclonic types of epilepsy (focal seizure) than other types (11,13, 14). Despite active health delivery system in primary health care in Iran, however undercounting EPs who are suffering a focal seizure, myoclonic jerks, nocturnal tongue biting, or subtle dyscognitive features (10), may result in selection biases, and misinterpretation in epilepsy's subtype can occur.

In the present study, patients with a longer seizure-free period from the last seizure had less chance of SR. According to the Das CP study, patients are less likely to have a recurrence when more than 3 months have passed since the first seizure (15).

In our study, SR in EPs was mainly (56.9%) occurred due to change in antiepileptic drugs (AED) schedules, lacking adherence to AED, and mental retardation. Other studies emphasized that epilepsy type, abnormal EEG and abnormal CT scan, head trauma, a history of a previous neurologic injury, prolonged seizures, status epilepticus, prior acute symptomatic seizures or a Todd paralysis, ischemic strokes, an abnormal neurological exam, are risk factors for SR (10). This research is a community-based study, which has carried out for the first time in Iran. The detailed information about EEG, CT-scan, and clinical findings based on neurologists' assessments was not recorded in patients' files in the primary health care delivery system. Besides, no computer-based relationship between the neurologists and family physicians was another limitation in our study, which caused a long time to share patients' documents following any seizure attack.

Following UHC implementation in the primary health delivery system that neuropsychiatric health packages were been integrated, the incidence rate of seizure recurrence attacks in epileptic patients was low.

Conflict of interest
Authors declare no conflict of interests.

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