Epidemiology of Epilepsy in Fayoum Governorate, Egypt: A Community-based Study

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Abstract

Background: Epilepsy is a major public health problem affecting around 70 million people worldwide. There is a lack of data about the prevalence of epilepsy in Fayoum governorate, Egypt. **Objectives**: To detect the prevalence of epilepsy in Fayoum, Egypt, and identify its relationship with socio-demographic characteristics such as age, sex, socioeconomic standard, and family history. **Methods:** A descriptive cross-sectional community-based study was conducted using a validated questionnaire. **Results:** The prevalence of epilepsy among Fayoum inhabitants was 12/1000, with 95% CI (8.5-16.5)/1000 of the population. The participants' number was 2746. The prevalence of active epilepsy was 6.9/1000, with 95% CI (4.4-10.8/1000). The prevalence of epilepsy was found to be higher in males (18.2 /1000) than females (5.8/1000). In terms of age, prevalence showed to be higher in younger age groups (less than 18 years) than older age groups. Male sex, low socioeconomic standard, and positive family history were identified as risk factors for epilepsy, with OR (95% CI) of 3.155 (1.323- 7.524), 2.944 (1.266 - 6.848), and 14.289 (5.078- 40.214), respectively. **Conclusion:** The prevalence of epilepsy is high in Fayoum Governorate. A highly prevalent epilepsy rate was reported in younger age groups.

Keywords: Epilepsy, Prevalence, Egypt. Active epilepsy

Introduction:

Epilepsy is a common chronic neurological disorder characterized by recurrent epileptic seizures that usually recur unpredictably in absence of provoking factors.[(1)] At least 50 million people globally suffer from epilepsy; 85% of them live in the developing countries.[(2)]

The overall prevalence of this disease is 10/1,000 people worldwide.[(3)] The worldwide prevalence of epilepsy is inconsistent among countries where it is found to be about 0.8% in North America.[(4)] However, it varies from 49 to 215 per 100,000 people among different regions of Africa.[(5)]

In children, the prevalence of epilepsy ranges from 3.2 to 5.5/1,000 in the developed countries and from 3.6 to 44/1,000 in the underdeveloped countries. Also, disease prevalence seems to be the highest in rural areas.[(6)] In Arab countries, the estimated prevalence of epilepsy in children ranges from 3.6 to 10.5/1,000 depending on the studied age groups.[(7)]

In Egypt, the epidemiologic data of epilepsy are lacking. Upper Egypt is characterized by a relatively high incidence and prevalence of epilepsy.[(8,9)] Depending

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on a community-based survey conducted in Qena governorate, the crude prevalence rate (CPR) of epilepsy is 12.46/1000 and active prevalence rate was 2.12/1000, while the incidence rate was 123/100000 [9].

The prevalence of epilepsy in children was 7.2/1000 among regular school children and 133.3/1000 among mentally subnormal children. [10]

Epilepsy has numerous causes, such as hypoxia-ischemia, intracranial hemorrhage, and CNS infection.[3] Genetic factors have a strong association with idiopathic epilepsy. In children, at least 50% of epilepsy causes are unknown. Causes of epilepsy in children can be divided into 3 groups: unknown, genetic, and structural/metabolic causes.[11, 12]

Epilepsy may be associated with many health problems which affect the quality of patient's life. The current study aimed to detect the prevalence of epilepsy in Fayoum Governorate and assess its relation with socio-demographic characters.

Methods:

Study Design and setting:

This is a community-based cross-sectional descriptive study implemented in Fayoum Governorate. The total population size in Fayoum is 3.596.954 in 2017, 22.5 % are urban population and 77.5% are rural population according to the Central Agency for Public Mobilization and Statistics. [13]

Fayoum governorate was divided into 6 districts; Fayoum, Etsa, Tamiya, Sinnuris, Youssef Sadiek, and Abshoay. The main capital of the governorate is Fayoum city which is considered as an urban area.

Ethical consideration:

This study was approved by the ethical committee of Faculty of Medicine, Fayoum University. Written informed consent was also obtained from the responsible member of each family (The ethical approval number was r148 on November 2019).

Sampling technique: A multistage stratified systematic random sample was followed to choose the study sample. First, Fayoum district was selected out of the six districts of Fayoum governorate as it is the main and largest district that has characteristics of urban population represented by Fayoum city and the rural population represented by surrounding villages.

The second one allying village selected was Benisaleh village in addition to one urban area in Fayoum city (Keman Fares around Fayoum university hospital (FUH)).

Third; in any of the sampling sites, the main street was selected then we went forward in one direction. Fourth, the first house was chosen randomly, and then every

fifth house was included. Eligible study participants were all residents in the selected houses and agreed to participate in the study. If a family refused to participate, we took the next house family.

Sample size calculation: To detect a point prevalence of 7 of 1000 from previous research, [14] with 95% confidence, the precision of 0.3, and non-response of 10%, the minimum required sample size was 2375 individuals. Through this study, the sample size was 2746 participants.

Data collection tools: An interviewer-administered pre-designed structured questionnaire was developed and composed of 2 parts; the first part recorded some socio-demographic data (age, sex, residence, education, and occupation). Socioeconomic state (SES) was recorded according to El-Gilany score.[15]

The second part included an epilepsy screening questionnaire validated by Eltallawy and colleagues. [16] The internal consistency of each question is 0.5 except for 4 questions. Cronbach's alpha and split-half reliability showed a high value (>0.6).

The questionnaire was composed of twelve questions, table 1. It was pre-tested in a pilot study of 15 epilepsy patients at the neurology clinic at FUH in which an age and sex-matched healthy group were interviewed to assess the questionnaire validity and understandability. The sensitivity and specificity of the questionnaire were set at 94% and 83%, respectively.

Data collection process:

Data collection was done in ten months from January to October 2020 via face-to-face interviews using the developed questionnaire by authors and five assistant lecturers. Six hundred households were studied where all members of each household included. Suspected respondents were then interviewed again by authors to confirm the diagnosis of suspected epilepsy.

Confirmation of Epilepsy cases:

All subjects suspected of having epilepsy during screening (those with a positive response to at least one of twelve questionnaire items) were referred to the neurology outpatient clinic at FUH where they were evaluated by the neurologist for confirmation of the diagnosis.

Thorough history taking and neurological examinations were done for all suspected cases. Further investigation; electroencephalography (EEG), Computerized tomography (CT), or Magnetic Resonance Imaging (MRI) brain imaging was done for patients. CT/MRI and EEG findings were correlated with clinical data. Diagnosis and classification of

epilepsies were carried out according to the international league against epilepsy (ILAE) criteria. Detailed anti-epileptic drug history was recorded to estimate the treatment gap.

The following definitions were employed in this study; an epileptic seizure is a transient occurrence of signs and/or symptoms due to abnormal excessive or synchronous neuronal activity in the brain. Epilepsy was defined as having two or more unprovoked epileptic seizures occurring twenty-four hours apart. [17]

Patients who reported taking medications had one or more seizures in the past year, or both were considered to have active epilepsy. [17] The seizure type was classified using the classification and terminology of ILAE Epilepsy as focal, generalized, and combined focal and generalized or unknown depending on the available data. [12]

Statistical analysis:

Data were collected, coded, and analyzed using Statistical Package for Social Science (SPSS version 16. Chicago IL, USA). Data were described in the form of means and standard deviations for numerical data, frequencies, and percent for qualitative data. The crude prevalence rate and age- and sex-specific prevalence rates were calculated. Prevalence was as number/1.000 (with a 95% confidence interval estimated using Wilson's method).

The total prevalence rate was adjusted with a direct method on the 2017 Egyptian population. A chi-square test was used to analyze the association of epilepsy with the studied factors. Logistic regression analysis was done to identify risk factors of epilepsy. The significance level was considered if $P \leq 0.05$.

Results:

A total of 600 families were included in the study; 28 families could not be examined either due to refusal or unavailability at the time of the study, leaving a final total of 2746 examinees (572 families).

Out of the study population, 1536 participants (55.9%) were in the age group of 18-40 years, and only 130 ones (4.7%) were of age less than 6 years old. Male participants represented 50.1% of the study population.

The majority were rural residents (66.1%), table 2. A number of 120 participants (4.36%) were suspected using a screening questionnaire. Out of the twelve screening questionnaire questions, the most appreciated response was falling of objects in 100 participants (3.6%), followed by the disturbance in consciousness in 83 participants (3%). After a neurological

assessment, 33 cases (0.12%) were diagnosed (figure 1). Active epilepsy cases were detected in 19 participants.

The prevalence of epilepsy among our participants was 12/1000 with CI (8.5-16.8) / 1000. The prevalence of active epilepsy was 6.9/1000 with 95% CI (4.4-10.8/1000).

The age-adjusted prevalence rate of epilepsy was 17/1000. Active epilepsy cases were detected in 19 participants; 4 cases of age ≤ 6 years old, representing 3.1% of this age group, 4 cases (3.6%) in the age 6-12 years, 4 cases (1.8%) aged 13-17 years, and the lowest proportion of active epilepsy cases was detected in the age groups 19-39 years (4, 0.26%) and 40-60 years (2, 0.32%).

The percentage of cases above the sixties was 2.4% (1 case). The age-adjusted prevalence rate of active epilepsy was 10/1000.

The prevalence of epilepsy was significantly higher in males than females (18/1000 versus 5.6/1000, p-value <0.001). The prevalence was significantly higher in the younger age groups (< 6 years and 6-12 years). Also, the prevalence of epilepsy was significantly higher in rural inhabitants than urban ones (16.5/1000 versus 3.2/000). No difference was detected in the disease prevalence in terms of socioeconomic standards and education levels.

Logistic regression analysis showed that low SES, male sex and, positive family history were reported as risk factors of epilepsy with odds ratio of 2.944 (1.266 - 6.848), 3.155 (1.323- 7.524), and 14.289 (5.078- 40.214), respectively, table 4.

Among 33 confirmed epilepsy cases, 13 cases (39.4) had generalized epilepsy, followed by focal type (12 cases, 36.4%), and combined generalized and focal type was detected in 8 cases (24.2%).

Etiological classification revealed that genetic epilepsy represented 57.6%, developmental epilepsy represented 30.3% (10 cases), and the unknown cause was reported in 4 cases (12.1%), table 5. The treatment gap was reported in 16 participants (84.2%) among active cases.

Discussion:

The burden of epilepsy in the developing countries not only affects patients with epilepsy but also their families and society. Epilepsy represents 27% of all neurological disorders and is associated with many physical and mental disabilities. [18]

The lifetime prevalence of this disease in the general population ranges from 2.3 to 15.9 per 1,000 in high-income countries and from 3.6 to 15.4 per 1,000 in low-income countries. [19]

In this study, the prevalence of lifetime epilepsy was 12/1000 population and that of active epilepsy was 6.9/1000 population. Although our results lie in the range of world figures, they are higher than other studies conducted in Egypt.

These percentages were higher than those reported by a community-based study among inhabitants of Al-Manial island in Cairo, Egypt where the lifetime prevalence of epilepsy was 6.9/1000 and active epilepsy was (5.1)/1000, [14].

Also, the lifetime prevalence rate of epilepsy in Al-Quseir was 5.5/1000 [20]. Our results may be similar to a community-based study conducted in Assiut, Egypt where the lifetime epilepsy prevalence was 12.67/1000 and active epilepsy prevalence was 9.3/1000. [8]

The higher prevalence in our study may be explained by the rural residence of the majority of our participants (66.1%). A high prevalence of lifetime epilepsy in rural areas than urban areas has been concluded in previous studies. [21, 22] Our results were consistent with these findings; we reported a high prevalence of epilepsy among rural inhabitants (16.5/1000) than urban ones (3.2/1000).

The current study revealed that the prevalence of epilepsy was higher in males (21.1/1000) than females (6.5/1000). This is consistent with a meta-analysis of 16 out of 29 door-to-door studies, 11 out of 16 record-review studies showed that males were more affected than females. [22]

Moreover, this is similar to previous findings of Egyptian studies.[20,23] Some studies found that the prevalence of epilepsy among males and females is nearly the same,[14] while other studies reported a higher prevalence in females than males .[24]

Regarding the prevalence of epilepsy in different age groups, the prevalence rate in this study reached its highest value during late childhood (6-12 years) (42.2 /1,000) which became slightly higher than early childhood (38.5/1000) and decreased in adolescent age (27.2/1000), reaching its least value during late adult life (0.87/1,000). Then it increased again during elderly life age > 60 years to reach 15/1000. This age difference pattern was nearly similar to what is reported in other previous studies. [8, 9, 18, 20]

The association between low SES and epilepsy was an important finding in our study; this association was reported in other studies in the developing countries[25, 26] which was explained by poor hygienic conditions of labor in addition to the presence of other risk factors such as infectious diseases and less access of low SES to medical clinics, health care providers, education, and medications.[27, 28]

We have 120 of our participants (4.36%) with a history suggestive of epilepsy with the most prevalent signs and symptoms in the form of involuntary movements of the hands (100 cases, 3.6%), followed by a disturbance in consciousness (3.0%).

However, only 9 newly cases were confirmed after neurological assessment; this is similar to Hashema and colleagues [14] findings who reported that 46/1000 of their participants had a history suggestive of epilepsy, but only 15 cases were confirmed to have epilepsy. This reflects the importance of screening and further assessment to confirm the diagnosis.

In the present work depending on clinical data, EEG, CT/ MRI, type of seizures and their possible causes were determined. The generalized type was found in 13 participants (39.4%), focal seizures represented in 12 participants (36.4%) out of 33; this was consistent with previous research findings that reported the predominance of generalized tonic-clonic seizures,[8] focal onset was the most common seizure type in other research studies.[23,25] Generalized seizures were observed in 56.5% of the children with epilepsy, whereas focal seizures were present in 43.5%.[23]

The exact etiology of epilepsy is unclear and still unknown. [28] No clear etiology was identified in 19 out of 33 of epilepsy cases (57.6%) which may be genetic or cryptogenic. The genetic cause is presumed due to the presence of a family history of convulsion in 19% of participants.

The remaining participants were classified as symptomatic epilepsy patients; mainly in the form of trauma, tumor, and encephalitis; however, Hashima et al[14] found that no etiology was identified in 8 cases of their patients (66.6%). Kaneko, et al[29] reported that head injury was the main cause of epilepsy and account for 5% of epilepsy and 20% of symptomatic epilepsy.

Family history and largely genetic factors are linked to epilepsy; our findings reported family history as a significant predictor of epilepsy, and this was consistent with previously conducted research.[30]

Our results reported that 84.2% of active epilepsy cases did not receive treatment or were not treated appropriately. Our figures are similar to previous research studies reported in the developing countries and Egypt.[20, 24]

Increased treatment gap may be due to non-compliance of patients or stigma of epilepsy disease, especially in rural areas. Moreover, this reflects lack of health care facilities with specialized neurologists. Decreasing the percentage of treatment gap

can be achieved by health screening and education campaigns in addition to the availability of epilepsy treatment at an affordable price.

Study Limitations:

The incidence of epilepsy can't be estimated due to the cross-sectional design of our work. No data about the type of treatment of epilepsy were collected. The small representative number for the two extreme age groups was a weak point.

Conclusion:

The prevalence of epilepsy in the present work was high (12/1000). Epilepsy was higher in the age group below 18 years. The prevalence was significantly higher in males than females. Epilepsy affects the cognitive, physical, and social aspects of the patient. So, further investigations and studies, especially in areas away from medical services, are required.

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Table (1): Frequency distribution of study participants regarding epilepsy questionnaire items (N=2746).

Items	N	%
▪ Disturbance in consciousness	83	3.022
▪ Loss of contact or response to the surroundings.	56	2.04
▪ Convulsions or involuntary movements in any part of the body or face.	74	2.69
▪ Mouth frothing	61	2.22
▪ Tongue biting	42	1.52
▪ Involuntary movement of the hand associated with falling of objects from the hand or falling on the ground without loss of consciousness.	100	3.64
▪ Numbness in one part or side of the body or the face	60	2.18
▪ Up rolling of the eye or its deviation to any side with twisting of the neck	55	2.00
▪ The occurrence of headache, body aches, or deep sleep following the seizure	40	1.46
▪ Have any of these symptoms occurred during sleep?	24	0.87
▪ Have you ever had an EEG?	57	2.07
▪ Has your case ever been diagnosed with epilepsy?	38	1.38

Table 2 Basal characteristics of study participants (N=2746), Egypt, Fayoum.

Characters	N (2746)	%
Sex		
▪ Male	1375	50.1
▪ Female	1371	49.9
▪ **Age in years**		
▪ <6	130	4.73
▪ 6-12	165	6.0
▪ 13—17	220	8.01
▪ 18-40	1536	55.94
▪ 40-60	630	22.94
▪ >60	65	2.37
Residence		
▪ Rural	1814	66.1
▪ Urban	932	33.9
Education*		
▪ Illiterate & read and write	1384	56.5
▪ Basic	130	5.3
▪ Secondary	887	36.2
▪ Higher education	50	2.0
Socioeconomic status		
▪ Low	662	24.1
▪ Moderate	1970	71.7
▪ High	114	4.2
****Family history of epilepsy** Yes, no (%)	523	19.05

*For participants >=12 **Family history was defined by history if the patients reported any relative had epilepsy

Table 3: Prevalence of epilepsy cases according to age & sex, Egypt, Fayoum,

Characters (N)	Epilepsy cases	Prevalence / 1000	CI (95%)	P-value
Sex				
▪ Males (1375)	25 (1.82)	18.2/1000	12.4-26.7	0.003*
▪ Females (1371)	8 (0.54)	5.8/1000	2.96-11.47	
Age				
▪ < 6 years **(**130**)**	5 (3.8)	38.5/1000	16.5-86.87	<0.001*
▪ 6—12 (165)	7 (4.2)	42.2/1000	20.7-84.97	
▪ 13-17 (220)	6 (2.7)	27.2/1000	12.56-58.21	
▪ 18-39 (1536)	12(0.78)	0.87/1000	4.7-13.6	
▪ 40-60 (630)	2 (0.3)	3.2/1000	0.87-11.5	
▪ >60 years old (65)	1(1.5)	15/1000	2.7-82.3	
Residence	30 (1.65)	16.5	11.6-23.5	0.002*
▪ Rural **(**1814**)**	3 (0.32)	3.2	1.1-9.4	
▪ Urban **(**932**)**				
Socioeconomic	10(2.0)	19.6	10-34.7	0.568
▪ Low **(**662**)**	21(1.2)	11.8	7.7-17.4	
▪ Moderate(1970)	2(7.1)	71.4	3.6-304.9	
▪ High (114)				

*P<0.05, significant.

12/1000(8.5-16.8)

Table 4 Risk factors for epilepsy (logistic regression model)

Risk factors	B	P-value.	OR(95%CI)
Socioeconomic class (low versus high and intermediate)	1.080	0.012*	2.944 (1.266 - 6.848)
Residence (rural versus urban)	0.574	0.398	1.775 (0.469 - 6.712)
Sex (male versus female)	1.149	0.010*	3.155 (1.323- 7.524)
Age	-0.061-	<0.001	0.941 (0.910 - 0.972
Education illiterate and basic education versus secondary and high education	0.090	0.854	1.094 (0.422 - 2.831)
Family history	2.660	<0.001*	14.289 (5.078- 40.214)
Constant	-5.714-	0.000	0.003

OR (Odds Ratio), CI (Confidence Interval)

Table 5 : Rate of different types of epilepsy

Different types of epilepsy	Genetic	developmental	Unknown	Total
Generalized	8 (42.1%)	4(40%)	1(25%)	13(39.4%)
Focal	6(31.6)	4(40%)	2(50%)	12(36.4)
Combined (Focal and generalized)	5(26.3)	2(20%)	1(25%)	8(24.2)
Total	**19(57.6%)**	**10(30.3%)**	**4(12.1%)**	33

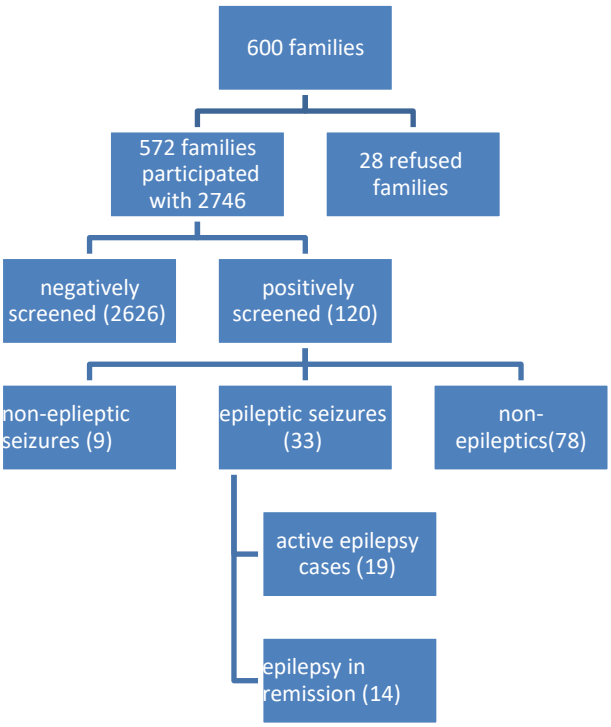

Figure 1: Hierarchy showing screening survey phases; out of 2746 screened individuals by questionnaire, 120 were possible cases. Out of these 120 cases, 33 cases were confirmed

الملخص العربي

وبائيات الصرع بمحافظة الفيوم، دراسة مجتمعية

وفاء يوسف عبد الواحد - هالة عبد المجيد شاهين - شربات حسنين ثابت- صفاء خميس حسن

الخلفية: الصرع مشكلة صحية عامة كبرى تؤثر على ما يقرب من 70 مليون شخص في جميع أنحاء العالم. هناك نقص في البيانات حول انتشار مرض الصرع في محافظة الفيوم، مصر. **أهداف الدراسة:** الكشف عن انتشار مرض الصرع في محافظة الفيوم، مصر، والتعرف على علاقته بالخصائص الاجتماعية والديموغرافية مثل العمر والجنس والمستوي الاجتماعي والاقتصادي والتاريخ العائلي. أجريت دراسة هذه الدراسة الوصفية باستخدام استبانة مكون من اثني عشر سؤالاً تم التحقق منه. كان حجم العينة 2746.

النتائج: بلغ مدى انتشار الصرع بين سكان الفيوم 1000/ (8.5-16.5) 12. كما كان مدى انتشار الصرع النشط ..1000 / (4.4-10.8) 6.9 كان الانتشار أعلى بشكل ملحوظ في الذكور (18.2/1000) عن الإناث 5.8/1000)، وبدراسة الانتشار حسب العمر وجد ان نسبة الصرع اعلي في م في الفئات العمرية الأصغر أقل من 18 عامًا عن الفئات الاكبر عمرا. تم تحديد عوامل الخطر المرتبطة بالصرع بواسطة الانحدار المتعدد. وجد ان جنس الذكور، المستوي الاقتصادي المنخفض، والتاريخ العائلي الإيجابي، من عوامل الخطر للصرع مع 95) OR٪ -1.323) 3.155 (CI (7.524، 6.848 - 1.266) 2.944) ، و 14.289 (5.078- 40.214) على التوالي. **الخلاصة:** ان مدى انتشار الصرع مرتفعا في محافظة الفيوم وكانت أعلي في الفئات العمرية الاصغر سنا.