

Epilepsy as a health problem among school children in Turaif, Northern Saudi Arabia, 2017

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Type of article: Original

Abstract

Background: Epilepsy is the most common serious neurological disorder and is one of the world's most prevalent non-communicable diseases. There are no recently published data on the prevalence of epilepsy in school children in Northern Saudi Arabia.

Objective: This study was conducted to determine the prevalence of epilepsy and to show some of its risk factors in school children and adolescents (6-18 years) in Turaif city, Northern Saudi Arabia.

Methods: This, population-based, cross-sectional study was conducted in Turaif city, over a 6-month period, from July 2016 to January 2017. It included pupils aged 6 to 18 years in all primary, preparatory and secondary schools in Turaif city. Multi-stage sampling was employed. A designated structured questionnaire was completed for each patient and included the patient's history, clinical examination, investigations and medications. Data were analyzed by SPSS version 16, using Chi-Squared test and descriptive statistics.

Results: Out of 1,230 children, 66 (5.5%) had epilepsy; 68.2% of them were males and 31.8% females ($p=0.000$). Consanguinity between parents plays a significant role where 59.1% of cases had parents who were cousins ($p=0.000$). Family history also had a significant effect as 68.2% of cases had epilepsy cases in their families ($p=0.000$).

Conclusion: Epilepsy prevalence among school children (6-18 years) in Turaif city is higher in males than females. Consanguinity and positive family history are important factors. Decision makers must take effective steps to limit the causes and risk factors of the problem.

Keywords: Prevalence, Epilepsy, Turaif, Northern border, Saudi Arabia

1. Introduction

Epilepsy is a group of neurological disorders characterized by epileptic seizures (1, 2). It is the commonest chronic, recurrent neurological childhood disease, and has become a major public health problem (3, 4). Very little is known about the exact mechanism of epilepsy (5), however, a little is understood regarding its cellular and network mechanisms. During a period of epilepsy, there is a decrease in the resistance to fire the excitatory neurons. This may be because of changes in ion channels or because of the inhibitory neurons failing to function correctly. This then results in development of seizures from a specific area of the brain, known as a "seizure focus" (6). Cases can occur as the result of brain injury, brain tumor, infections of the brain, stroke, and birth defects, which occur through a process called epileptogenesis (7-9). However, how the brain shifts into the activity of a seizure with its excessive synchronization remains unclear (10, 11). Both genetic and acquired causes such as serious brain trauma, tumors stroke, and complications resulting from previous infection, can be the cause of epilepsy, with interaction of these

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Received: June 10, 2017, Accepted: July 11, 2017, Published: August 2017

iThenticate screening: July 11, 2017, English editing: August 10, 2017, Quality control: August 12, 2017

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factors in many cases (12). The cause of epilepsy is unknown in about 60% of all cases (13). Valid and reliable information is needed concerning the prevalence of epilepsy and its natural course and causes, to better develop the approach to epilepsy treatment, analyze the efficiency of therapeutic strategies and, more importantly, determine methods for the prevention of its development. Epidemiological studies can provide such information (4, 14, 15). Many studies have discussed epilepsy among school children. A study in Turkey found that among 1,625 primary-school students aged 6 to 14 years, twenty-two children were diagnosed as epileptic. In male patients, the point prevalence of active epilepsy was 4.9/1000, and in female patients, it was 12.4/1000, representing a total of 8.6/1000. In males, the cumulative prevalence was 11.0/1000, and in females, it was 16.1/1000, representing a total of 13.5/1000. Febrile convulsions, history of head trauma, family history of epilepsy, antenatal/postnatal problems, serious maternal illness during pregnancy, and a history of neonatal jaundice all had a statistically significant relation to the development of epilepsy (16). In another study in Kayseri (17), it was revealed that in males the raw prevalence of epilepsy was 9/1000, in females it was 6/1000 and in both groups together, it was 8/1000. Prevalence of active epilepsy in males was 7/1000, in females it was 4/1000, and in both groups together it was 6/1000. It was found that risk of epilepsy increased 2.6 times due to premature birth, and risk of epilepsy due to average and poor family income levels increased 3.3 and 1.6 times, respectively. Risk of epilepsy increased 15.1 times due to history of febrile convulsion. There are no recently published data on the prevalence of epilepsy in school children in Northern Saudi Arabia. This study was conducted to determine the prevalence of epilepsy and to show some of its risk factors in school children and adolescents (6 to 18 years) in Turaif city, Northern Saudi Arabia.

2. Material and Methods

2.1. Setting and design

This, population-based, cross-sectional study was conducted in Turaif city, over a six-month period, from July 2016 to January 2017. The study was conducted in Turaif city, the capital of the Northern area of Saudi Arabia. Within the city, government and private schools were distributed according to population density and demand. It included pupils aged 6 to 18 years in all primary, preparatory and secondary schools in Turaif city. It did not include schools for children with special needs. The study was undertaken in two phases: the first consisted of interviews by authors and field workers to identify pupils with possible epilepsy, and the second phase comprised validation, medical evaluation and management by the pediatric neurologists.

2.2. Selection criteria

Inclusion criteria was all school children in Turaif city (public and private schools), and exclusion criteria was all schools for children with special needs.

2.3. Sampling

Multi-stage sampling was employed. First, simple random sampling was used to draw a cluster of four clusters out of seven in the city. Information on the number of public and private schools and pupils was obtained from the Ministry of Education, Northern Saudi Arabia. The sample frame in the selected localities consisted of public and private schools. A sample size of 1,230 students was determined with a 95% confidence interval, 0.25% margin of error, a population size of 10,285 students and a design effect of 1.5 to account for the multi-stage sampling design, given the increase in variance arising from the cluster. To calculate the sample size, the population prevalence of epilepsy in school-age children was assumed to be 50%. Assuming an average of 303 students per school, 5 schools were drawn from a sample frame of 35 schools using a stratified random sampling technique. The sample was stratified by locality, school type (public or private) and gender. The sample was distributed among the four localities in proportion to the total number of schools in each. The schools in each stratum were selected by simple random sampling using random digit tables.

2.4. Data collection

Before the study commenced, all data collectors were briefed during a one-day training session. The data collectors were junior doctors and final year's medical students in addition to field supervisors from the Department of Community Medicine, Faculty of Medicine, and Northern Border University. The main aim of the training was to improve reliability and consistency. A confidential letter was sent to the parents of each case identified, explaining the aims of the study and providing information on the research group and the kind of help that would be offered to the pupil. Parents who consented to their child's participation in the study were asked to contact the study group by telephone or email. All nominated children attended the Outpatient Department for further assessment including history-taking, clinical examination and EEG (when required) by a pediatric neurologist. A structured questionnaire was completed for each patient and included the patient's history, clinical examination, investigations and

medications. An EEG was requested for every patient who was clinically suspected of having had an epileptic seizure. Patients were classified according to the International League against Epilepsy classification, and were managed accordingly (18).

2.5. Ethical considerations

Approval was granted by the Northern Border University Research and Ethics Committee, The Ministry of Health and the Ministry of Education in Arar city. Verbal consent was obtained from headmasters after the aims of the study had been explained. Consent was also obtained from the parents of the study pupils. Confidentiality was ensured at all stages.

2.6. Statistical analysis

Data were compiled and analyzed using SPSS version16 (SPSS Inc., Chicago, Illinois, USA) and results were analyzed with frequencies and Chi-squared test as appropriate. P-value were set at 5%.

3. Results

Table 1 illustrates the Socio-demographic characteristics of studied children, Turaif, Northern Saudi Arabia, 2017. The findings showed that male to female ratio was 81.2 to 18.8, Saudi to non-Saudi ratio 90 to 10, mothers aged 20 to 39 years constituted 50.5% and 46.3% aged 40 to 60 years.

Table 1. Socio-demographic characteristics of studied children, Turaif, Northern Saudi Arabia, 2017.

Parameter		Frequency (n=1230)	%
Child's age group (years)	6-12	501	40.7
	13-15	495	40.2
	16-18	234	19.0
Sex	Male	999	81.2
	Female	231	18.8
Age (years)	< 18	126	8.0
	18-50	1362	86.9
	> 50	79	5.0
Nationality	Saudi	1107	90.0
	Non-Saudi	123	10.0
Mother's age group (years)	20-39	621	50.5
	40-59	570	46.3
	≥60	39	3.2
Mother's education	Primary	198	16.1
	Preparatory	252	20.5
	Secondary	237	19.3
	University	381	30.0
	Illiterate	162	13.2
Mother's work	Working	312	25.4
	Not working	918	74.6
Father's age group (years)	20-39	153	12.4
	40-59	942	76.6
	60 and above	135	11.0
Father's education	Primary	237	19.3
	Preparatory	162	13.2
	Secondary	324	26.3
	University or more	272	30.3
	Illiterate	135	11.0
Consanguinity	Cousins	453	36.8
	Relatives of the same family	372	30.2
	Non-relatives of the same family	105	8.5
	No relation	300	24.4
Family history of epilepsy	Yes	162	13.2
	No	1068	86.8
Other chronic diseases	Yes	51	4.1
	No	1179	95.9

Primary educated constituted 16.1%, 20.5% had preparatory education, 30.0% university and more and 13.2% were illiterate, working to non-working mother ratio was 25.4 to 74.6. As regards consanguinity, 36.8% were cousins, 30.2% relatives of the same family, 8.5% non-relatives of the same family and in 24.4% there was no relation. Family history of epilepsy was found in 13.2% of the studied children. Table 2 illustrates the prevalence of epilepsy among studied children in Northern Saudi Arabia, 2016/2017. The table showed that 60 (5.5%) of the total (1,230) studied cases had epilepsy. From the 66 epileptic children, 22.7% had one fit per month, 68.2% had 2-5 fits, and 9.1% had more than 5 fits per month. In total, 90.9% had regular treatment. The majority (63.6%) had history of hospital admission due to epilepsy. As regards the response to treatment, 68.2% felt better, 27.3% had no apparent response but 4.5% became worse in spite of the treatment. Table 3 illustrates the relationship between epilepsy and epilepsy related characteristics among studied children in northern Saudi Arabia in 2017. The table showed that 45 (68.2%) of the cases were males and about half this number 21 (31.8%) were females ($p=0.000$). Child's age in years and consanguinity between parents were significantly associated with the development of epilepsy where 59.1% of epilepsy patients who participated in the current study had parents who were cousins and 13.6% were non-relatives of the same family and only 22.7% of cases had no relation between their parents ($p=0.000$). Family history of epilepsy was significantly associated with the development of it where 68.2% of epilepsy patients who participated in the current study had positive family history while about half of them (31.8%) had negative family history ($p=0.000$). Mother and father age groups were also significantly associated with the development of epilepsy ($p=0.000$). More than half (54.5%) of cases had working mothers ($p=0.000$).

Table 2. Prevalence of epilepsy among studied children, northern Saudi Arabia, 2017

Variable		n	%
Epilepsy (n=1230)	Yes	66	5.5
	No	1164	94.5
Frequency of fits per month (n=66)	One time or less	15	22.7
	2 – 5	45	68.2
	> 5	6	9.1
Treatment of epilepsy (n=66)	Yes	60	90.9
	No	6	9.1
Regularity of treatment (n=66)	Regular	60	90.9
	Irregular	6	9.1
History of hospital admission (n=66)	Yes	42	63.6
	No	24	36.4
Response to treatment (n=66)	Better	45	68.2
	Worse	3	4.5
	Same	18	27.3

Table 3. Relationship between epilepsy and epilepsy related characteristics among studied children, northern Saudi Arabia, 2017.

Parameter	Chi-squared	p-value
Sex	6.81	0.006
Child's age group in years	5.79	0.055
Consanguinity between parents	26.81	0.00
Family history of epilepsy	116.4	0.000
Mother's age group in years	0.503	0.000
Father's age group in years	13.41	0.001
Mother's work	14.86	0.000
Previous abdominal surgery	1.005	0.00
Previous abdominal trauma	38.533	0.00
Family history of hernia	23.995	0.00
Grand multipara (repeated pregnancy more than 5 times)	38.523	0.000

4. Discussion

Epilepsy is the most common serious neurological disorder and is one of the world's most prevalent non-communicable diseases. The condition affects approximately 50 million people. Around 40 million of them living in developing countries (19). Efforts to provide treatment were successful, which has highlighted the importance of using community-based methods (20). Epilepsy is more prevalent in older people (21, 22). Though, in developing

nations, it is more prevalent in older children and young adults, due to differences in the regularity of the fundamental causes (23). Prevalence rates of active epilepsy in developing nations range from 5 to 10 per 1000 people (24-26). There are no recently published data on the prevalence of epilepsy in school children in Northern Saudi Arabia. So, this study was conducted to determine the prevalence of epilepsy and to show some of its risk factors in school children in Turaif city, Northern Saudi Arabia. In our study, 66 children (5.5%) out of 1,230 had epilepsy; 45 (68.2%) were males and 21 (31.8%) were females. The prevalence of epilepsy in studies to date exhibits a wide variation ranging between 2.8/1000 and 44/1000 (39-60). A study of neurological disorders in Saudi Arabia (27) found that epilepsy was prevalent with a percent of (6.54%). The prevalence (per 1000 population) in many countries were 9.8 in Pakistan (28), 6.7-8 in different regions of Ecuador (29), 5.7-6.8 in USA (30, 31), 5.3 in Nigeria (32), 4.8 in the Peoples' Republic of China (33), 4.8 among the Parsi community in India (34) and 3.6 in Tunisia (35). In a study by W. Allen et al. (36), the incidence of epilepsy (recurrent unprovoked seizures) in children and adolescents seems relatively consistent across all populations studied, ranging from 50 to 100/100,000. The highest incidence of epilepsy is in the first year of life. In our study, 45.5% of the cases were 6 to 12 years and there was highly significant association between age and sex and prevalence of epilepsy ($p=0.000$). Another study found that the median age of onset of seizures was 8 years (37). Another study found that the mean age of subjects diagnosed with epilepsy was 11.94 ± 2.99 years, but they found no significant difference between males and females in terms of epilepsy ($p=0.098$) (17). Other studies have reported a 1.4-fold greater prevalence of epilepsy in males compared to females (39, 40). Regarding risk factors for epilepsy, our results show that about (68.2%) had relatives of the same family with history of epilepsy, and there was a significant association between family history and epilepsy ($p=0.000$). A Prischich et al. study reported that there was a significant association between family history and epilepsy (38). Another study's analysis of epilepsy case risk factors revealed positive family history in 40% of epilepsy cases (17). Consanguinity between parents was significantly associated with the development of epilepsy where 59.1% of epilepsy patients who participated in the current study had parents who were cousins and 13.6% were non-relatives of the same family and only 22.7% of cases had no relation between their parents ($p=0.000$). This agreed with the results with the twin studies of Lennox (41, 42) that found a genetic link to epilepsy. Further population studies revealed an increased familial clustering of epilepsy among first degree and to a lesser degree, second degree relatives (43).

5. Conclusions

Epilepsy is a common neurological disorder in this part of Saudi Arabia, its prevalence among school children (6-18 years) is 5.5%, which is higher in males than in females. It is associated with consanguinity and positive family history. Decision makers must take effective steps to limit the causes and risk factors of the problem. Adequate and proper prenatal care aimed at avoiding problems during pregnancy and perinatal measures could reduce complications that may result in epilepsy. Strengthening of the health systems to include information about the risk factors for Epilepsy in their outreach programs could reduce the prevalence of epilepsy in Turaif, Northern Saudi Arabia.

Acknowledgments:

The success and final outcome of this work required the support and assistance of many people and we are fortunate to have gotten this throughout the completion of the work. We appreciate the support and cooperation of Abd al-Rahman ibn 'Awf primary school in Turaif city. Our thanks also go to Nour Homoud Alanazi, Yasir Wadi Alanazi, Arwa Nughaymish Alanazi, Amjad Hamoud Alruwaili and Anwar Matar Alsulobi (Students, Faculty of Medicine NBU) for their help in different steps of the research.

Conflict of Interest:

There is no conflict of interest to be declared.

Authors' contributions:

All authors contributed to this project and article equally. All authors read and approved the final manuscript.

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