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Specific learning disorders in epileptic children

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Abstract

Specific learning disorders are more common in epileptic children even with normal IQ, The Epilepsy related factors such as (duration of illness , type and severity of epilepsy and medications used) are strongly related to increase risk of learning disorders. The present study is aimed to shed the light on the specific learning disorders in epileptic children and to study the relation between learning disorders and the epilepsy related factors such as duration , medications , type and severity of epilepsy. Also to study the relation between the learning disorders and the intelligence quotient.

The study was conducted on 60 children between the age group of 9and 12 years old.All were subjected to a Semi structured interview, Learning & Developmental Disorders Rating Scales (LDDRS) Battery (El-Zyat , 2007), Stanford-Binet Intelligence Scales (SB5), Fifth Edition translated by (Farag,2010).

The results showed that Seizures was not the only problem that children with epilepsy are suffering from but also they are at greater risk for developing learning Disabilities. From the developmental disorders attention disorder was the most common detected followed by memory then auditory processing disorder followed by visual processing disorder then motor skills disorders. While regarding the academic learning disorders reading disorder was the most prevalent followed by the writing and mathematics being the least detected among the studied group. It is concluded that the most leading causes for learning disability in epileptic children ,as verified in the studied group, were the severity of epilepsy and type of therapy.

Keywords: Learning disorders; epilepsy; intelligence quotient,children

1 Introduction

Epilepsy is one of the commonest neurological disorders in childhood with an estimated prevalence in 4–5/1,000.. Learning Disorders are more common in people with epilepsy than in the general population (Williams., 2003): about 25% of patients with epilepsy are said to have Learning Disorders , Various psychosocial, medication-related, and epilepsy-related factors may be associated with Learning Disorders in epilepsy, Learning Disorders are not necessarily related to mental retardation *(*Massimiliano Beghi et al., 2006).

Specific learning disorder is diagnosed through a clinical review of the individual's developmental, medical, educational, and family history, reports of test scores and teacher observations, and response to academic interventions. The diagnosis requires persistent difficulties in reading, writing, arithmetic, or mathematical reasoning skills during formal years of schooling. Symptoms may include inaccurate or slow and effortful reading, poor written expression that lacks clarity, difficulties remembering number facts, or inaccurate mathematical reasoning. Current academic skills must be well below the average range of scores in culturally and linguistically appropriate tests of reading, writing, or mathematics. The individual's difficulties must not be better explained by developmental, neurological, sensory (vision or hearing), or motor disorders and must significantly interfere with academic achievement, occupational performance, or activities of daily living (DSM.,2013).

Patients with epilepsy are at risk of LDs for several reasons, including epilepsy per se, its pharmacologic and

surgical treatment, the presence of an underlying epileptogenic condition with brain involvement, the emotional reactions to the disease, and association purely by chance (Ettore et al., 2001).Considering this controversy, this study conducted to assess learning disorders in Epilptic children and Epilepsy related factors.

2 Patients and Methods

This study is a cross-sectional, observational study, conducted from May 2015 to April 2016. In the child psychiatry outpatient clinic at Benha psychiatric hospital, Benha city, Qaliobya governorate. informed consent had been taken from the parents of the children.

***Patients*:**

Participants will be chosen by non random technique , all Epileptic the children attending the outpatient clinic ,fulfilling the inclusion and exclusion criteria and agree to participate will join the research.

Inclusion Criteria: (1)Male and female subjects, (2)Age: 9-12 years,(3)A diagnosis of epileptic disorder from neurology specialist, (4) A complete neurological assessment to exclude organcity and (5) Receiving antiepileptic treatment in ordinary governmental education.

Exclusion Criteria: (1) Age more than 12 or less than 9, (2)Evidence of any organic etiology for the current presentation of specific learning disorders, (3) Evidence of any psychiatric or neurological disorder,(4)Epileptic children with IQ blow (75), (5) Any child with sensory disability and (6)Any child in special education private school or home.

Methods:

All patients were subjected to the following:

Semi structured interview to collect and assess the following :

Personal data, Present history, Family history, Physical health status.

Past history, Examination: physical and neurological examination .

Learning & Developmental Disorders Rating Scales (LDDRS) Battery (El-Zyat , 2007). The battery is formed of questionnaires assessing : attention ,auditory perocessing, visual processing, motor skills ,memory, reading difficulties , writing difficulties , math difficulties.

Each item is formed of 20 questions It is applied on the child parent's.

Stanford-Binet Intelligence Scales (SB5), Fifth Edition translated by (Farag,2010). The test measures five weighted factors and consists of both verbal and nonverbal subtests. The five factors being tested are:(1) knowledge, (2)quantitative reasoning, (3)visual-spatial processing , (4) working memory, (5)fluid reasoning.

The *SB*5 supports early prediction of emerging learning disabilities in children as young as two years old, and can be used for examinees over 85 years of age. It was translated into Arabic by (Farag,2010).

Interictal EEG

Electroencephalography (EEG)

It is an electrophysiological monitoring method to record electrical activity of the brain . It is typically noninvasive, with the electrodes placed along the scalp.

Interictal EEG refers to doing EEG during the period between seizures, the interictal state corresponds to more than 99% of their life. The interictal period is often used by neurologists when diagnosing epilepsy since an EEG trace will often show small interictal spiking and other abnormalities known by neurologists as subclinical seizures , Interictal EEG discharges are those abnormal waveforms not associated with seizure symptoms.

3 Results

The study was conducted on 60 children aged between (9-12years old) previously diagnosed with epilepsy and they are under antiepileptic treatment. 41 males and 19 females ,31 with Generalized & 29 with focal epilepsy , 43 of them with their seizures controlled now & 17 are not under control although they are on medical treatment. Table1 shows that there are 60 childern with mean age 10.56(68.3%) years 41 of them are males & 19(31.7%) are females.

Table2 shows that there are 29 child (48.3%) with focal type of epilepsy & 31 child(51.7%) with generalized type of epilepsy,38(63.3%), High percentage of them taking monotherapy35(58.3%), 15(25%) under 2 antiepileptics,10(16.7%) under more than 2 anti epileptics, mean duration of illness is about 43.3 monthes, 43 child(71.7%) of them with good response on treatment &17child(28.3%) with bad response, mean IQ (101.17)

Table 3 shows that there is no significant correlation between different scors of learning Abilities in epileptic children and duration of Epilepsy. Table 4 shows the scores of 8 types of learning disorders &the mean of each of them ,the highest was to Attention disorders (49.22), followed by Memory disorders(42.73) ,the least score was to Movement disorders with mean (22.53) then to visual perception disorders(26.63), mean of auditory perception (28.7)and that of Reading disorders (38.53).Writing disorders(40.92), Mathematics (39.5).

Table1.Distribution of the studied group regarding personal data.

	No (60)	*%*
Age/y mean ±SD (range)	*10.56±1.08 (9.0 -12.25)*	
Sex		
Male	*41*	*68.3*
Female	*19*	*31.7*

Table2.Discription of epilepsy in the studied sample.

		No (60)	%
Type of epilepsy			
Focal		29	48.3
Generalized		31	51.7
Ttt			
Monotherapy		35	58.3
Polytherapy		25	41.7
1=Sodium Valproate		38	63.3
2=Carbamazebine		31	51.7
3=Lamotrigine		10	16.7
4=Levitracitam		8	13.3
5=Oxacarbazepine		5	8.3
6=phentoin		2	3.3
7=ethoximide		1	1.7
Duration /m	mean ±SD (range)	43.03±48.96 (1-148m)	
Response			
Controlled		43	71.7
Non controlled		17	28.3
IQ	mean ±SD (range)	101.17±15.28 (76-145)	

Table4 shows the differences in the scores regarding sex. There is significant statistical relation between sex & learning the scores are higher in males than females.
Table 5 there is no significant statistical data in relation between the Type of epilepsy & learning except for Reading & writing Disorders.
Table 6 shows there is significant statistical difference in the scores of IQ & learning favour the use of monotherapy than the multiple therapies.
Table 7 the (p value) is highly significant for the favor of controlled cases In (Reading, Writing and Mathematics).
There is no significant correlation between different scors of learning Abilities in epileptic children and duration of Epilepsy(table8).
Table 9 high significant statistical relation between IQ and learning abilities the low the IQ the sever the learning problem, the P value is highly Significant.

Table3. Distribution of the studied group regarding the scores of learning abilities and IQ items.

		No (60)	%
Attention	mean ±SD (range)	49.22±19.65 (12-77)	
	No problem	9	15.0
	Mild	9	15.0
	Moderate	16	26.7
	Severe	26	43.3
Auditory perception		28.07±14.9 (10-66)	
	No problem	22	36.7
	Mild	25	41.7
	Moderate	8	13.3
	Severe	5	8.3
Visual perception		26.63±15.09 (2-67)	
	No problem	26	43.3
	Mild	24	40.0
	Moderate	8	13.3
	Severe	2	3.3
Movement		22.53±15.07 (5-68)	
	No problem	29	48.3
	Mild	23	38.3
	Moderate	5	8.3
	Severe	3	5.0
Memory		42.73 ±20.76 (4-80)	
	No problem	11	18.3
	Mild	16	26.7
	Moderate	18	30.0
	Severe	15	25.0
Reading		38.53±18.49 (11-80)	
	No problem	10	16.7
	Mild	23	38.3
	Moderate	19	31.7
	Severe	8	13.3
Writing		40.92±19.01 (10-72)	
	No problem	12	20.0
	Mild	15	25.0
	Moderate	22	36.7
	Severe	11	18.3
Mathematics		39.5±19.22 (4-70)	
	No problem	13	21.7
	Mild	18	30.0
	Moderate	14	23.3
	Severe	15	25.0

Table4) Sex differences regarding scores of learning abilities items and IQ.

Sex	*Male (41)*	*Female(19)*	*Test*	*P value*
IQ				
Very superior	*4(9.8)*	*3(15.8)*	*^13.81*	*0.004***
Superior	*3(7.3)*	*8(42.1)*		
Average	*21(51.2)*	*6(31.6)*		
Dullness	*9(22.0)*	*0(0.0)*		
Borderline deficiency	*4(9.8)*	*2(10.5)*		
Attention				
No	*3(7.3)*	*6(31.6)*	*^17.2*	*0.001***
Mild	*3(7.3)*	*6(31.6)*		
Moderate	*11(26.8)*	*5(26.3)*		
Severe	*24(58.5)*	*2(10.5)*		
Auditory perception				
No	*10(24.4)*	*12(63.2)*	*^7.78*	*0.04**
Mild	*20(48.8)*	*5(26.3)*		
Moderate	*7(17.1)*	*1(5.3)*		
Severe	*4(9.8)*	*1(5.3)*		
Visual perception				
No	*12(29.3)*	*14(73.7)*	*^11.54*	*0.004***
Mild	*21(51.2)*	*3(15.8)*		
Moderate	*7(17.1)*	*1(5.3)*		
Severe	*1(2.4)*	*1(5.3)*		
Movement				
No	*16(39.0)*	*13(68.4)*	*^4.34*	*0.182*
Mild	*18(43.9)*	*5(26.3)*		
Moderate	*4(9.8)*	*1(5.3)*		
Severe	*3(7.3)*	*0(0.0)*		
Memory				
No	*7(17.1)*	*4(21.1)*	*^7.26*	*0.061*
Mild	*7(17.1)*	*9(47.4)*		
Moderate	*14(34.1)*	*4(21.1)*		
Severe	*13(31.7)*	*2(10.5)*		
Reading				
No	*9(22.0)*	*1(5.3)*	*^23.75*	*0.001***
Mild	*7(17.1)*	*16(84.2)*		
Moderate	*18(43.9)*	*1(5.3)*		
Severe	*7(17.1)*	*1(5.3)*		
Writing				
No	*9(22.0)*	*3(15.8)*	*^10.39*	*0.013**
Mild	*5(12.2)*	*10(52.6)*		
Moderate	*18(43.9)*	*4(21.1)*		
Severe	*9(22.0)*	*2(10.5)*		
Mathematics				
No	*9(22.0)*	*4(21.1)*	*^10.67*	*0.012**
Mild	*7(17.1)*	*11(57.9)*		
Moderate	*12(29.3)*	*2(10.5)*		
Severe	*13(31.7)*	*2(10.5)*		

Table5.Comparison between types of epilepsy regarding different scores of learning abilities and IQ.

Type of epilepsy	*Focal (29)*	*Generalized (31)*	*Test*	*P value*
IQ				
Very superior	***3(10.3)***	***4(12.9)***	***^5.36***	***0.25***
Superior	***4(13.8)***	***7(22.6)***		
Average	***17(58.6)***	***10(32.3)***		
Dullness	***4(13.8)***	***5(16.1)***		
Borderline deficiency	***1(3.4)***	***5(16.1)***		
Attention				
No	***7(24.1)***	***2(6.5)***	***^3.89***	***0.281***
Mild	***4(13.8)***	***5(16.1)***		
Moderate	***6(20.7)***	***10(32.3)***		
Severe	***12(41.4)***	***14(45.2)***		
Auditory perception				
No	***13(44.8)***	***9(29.0)***	***^3.8***	***0.276***
Mild	***10(34.5)***	***15(48.4)***		
Moderate	***5(17.2)***	***3(9.7)***		
Severe	***1(3.4)***	***4(12.9)***		
Visual perception				
No	***13(44.8)***	***13(41.9)***	***^2.27***	***0.57***
Mild	***13(44.8)***	***11(35.5)***		
Moderate	***3(10.3)***	***5(16.1)***		
Severe	***0(0.0)***	***2(6.5)***		
Movement				
No	***14(48.3)***	***15(48.4)***	***^4.3***	***0.233***
Mild	***11(37.9)***	***12(38.7)***		
Moderate	***4(13.8)***	***1(3.2)***		
Severe	***0(0.0)***	***3(9.7)***		
Memory				
No	***5(17.2)***	***6(19.4)***	***$4.44***	***0.218***
Mild	***9(31.0)***	***7(22.6)***		
Moderate	***11(37.9)***	***7(22.6)***		
Severe	***4(13.8)***	***11(35.5)***		
Reading				
No	***8(27.6)***	***2(6.5)***	***^12.12***	***0.006***
Mild	***11(37.9)***	***12(38.7)***		*****
Moderate	***10(34.5)***	***9(29.0)***		
Severe	***0(0.0)***	***8(25.8)***		
Writing				
No	***8(27.6)***	***4(12.9)***	***$4.33***	***0.228***
Mild	***9(31.0)***	***6(19.4)***		
Moderate	***8(27.6)***	***14(45.2)***		
Severe	***4(13.8)***	***7(22.6)***		
Mathematics				
No	***7(24.1)***	***6(19.4)***	***$6.78***	***0.079***
Mild	***10(34.5)***	***8(25.8)***		
Moderate	***9(31.0)***	***5(16.1)***		
Severe	***3(10.3)***	***12(38.7)***		

Table 6.Comparison between types of therapy regarding the scores of IQ and learning abilities items.

Therapy	*One drug (36)*	*Multiple drugs (24)*	*Test*	*P value*
IQ				
Very superior	***7(19.4)***	***0(0.0)***	***^13.9***	***0.005***
Superior	***7(19.4)***	***4(16.7)***		*****
Average	***17(47.2)***	***10(41.7)***		
Dullness	***5(13.9)***	***4(16.7)***		
Borderline deficiency	***0(0.0)***	***6(25.0)***		
Attention				
No	***7(19.4)***	***2(8.3)***	***^7.02***	***0.07***
Mild	***4(11.1)***	***5(20.8)***		
Moderate	***13(36.1)***	***3(12.5)***		
Severe	***12(33.3)***	***14(58.3)***		
Auditory perception				
No	***18(50.0)***	***4(16.7)***	***^9.43***	***0.018***
Mild	***14(38.9)***	***11(45.8)***		*****
Moderate	***2(5.6)***	***6(25.0)***		
Severe	***2(5.6)***	***3(12.5)***		
Visual perception				
No	***20(55.6)***	***6(25.0)***	***^9.57***	***0.014***
Mild	***14(38.9)***	***10(41.7)***		*****
Moderate	***2(5.6)***	***6(25.0)***		
Severe	***0(0.0)***	***2(8.3)***		
Movement				
No	***25(69.4)***	***4(16.7)***	***^18.13***	***0.001***
Mild	***7(19.4)***	***16(66.7)***		*****
Moderate	***2(5.6)***	***3(12.5)***		
Severe	***2(5.6)***	***1(4.2)***		
Memory				
No	***11(30.6)***	***0(0.0)***	***^17.31***	***0.001***
Mild	***12(33.3)***	***4(16.7)***		*****
Moderate	***9(25.0)***	***9(37.5)***		
Severe	***4(11.1)***	***11(45.8)***		
Reading				
No	***8(22.2)***	***2(8.3)***	***^7.84***	***0.047***
Mild	***17(47.2)***	***6(25.0)***		*****
Moderate	***7(19.4)***	***12(50.0)***		
Severe	***4(11.1)***	***4(16.7)***		
Writing				
No	***12(33.3)***	***0(0.0)***	***^17.63***	***0.001***
Mild	***11(30.6)***	***4(16.7)***		*****
Moderate	***7(19.4)***	***15(62.5)***		
Severe	***6(16.7)***	***5(20.8)***		
Mathematics				
No	***11(30.6)***	***2(8.3)***	***$11.59***	***0.009***
Mild	***14(38.9)***	***4(16.7)***		*****
Moderate	***5(13.9)***	***9(37.5)***		
Severe	***6(16.7)***	***9(37.5)***		

Table7.Comparison between different response to ttt regarding the scores of IQ and learning abilities items.

Response	*Controlled (43)*	*Not controlled (17)*	*Test*	*P value*
IQ				
Very superior	*6(14.0)*	*1(5.9)*	*^7.33*	*0.098*
Superior	*6(14.0)*	*5(29.4)*		
Average	*22(51.2)*	*5(29.4)*		
Dullness	*7(16.3)*	*2(11.8)*		
Borderline deficiency	*2(4.7)*	*4(23.5)*		
Attention				
No	*7(16.3)*	*2(11.8)*	*^12.31*	*0.004***
Mild	*4(9.3)*	*5(29.4)*		
Moderate	*16(37.2)*	*0(0.0)*		
Severe	*16(37.2)*	*10(58.8)*		
Auditory perception				
No	*16(37.2)*	*6(35.3)*	*^1.28*	*0.765*
Mild	*19(44.2)*	*6(35.3)*		
Moderate	*5(11.6)*	*3(17.6)*		
Severe	*3(7.0)*	*2(11.8)*		
Visual perception				
No	*18(41.9)*	*8(47.1)*	*^6.22*	*0.081*
Mild	*20(46.5)*	*4(23.5)*		
Moderate	*5(11.6)*	*3(17.6)*		
Severe	*0(0.0)*	*2(11.8)*		
Movement				
No	*21(48.8)*	*8(47.1)*	*^0.553*	*1.0*
Mild	*16(37.2)*	*7(41.2)*		
Moderate	*4(9.3)*	*1(5.9)*		
Severe	*2(4.7)*	*1(5.9)*		
Memory				
No	*11(25.6)*	*0(0.0)*	*^6.13*	*0.105*
Mild	*10(23.3)*	*6(35.3)*		
Moderate	*12(27.9)*	*6(35.3)*		
Severe	*10(23.3)*	*5(29.4)*		
Reading				
No	*10(23.3)*	*0(0.0)*	*^6.66*	*0.069*
Mild	*15(34.9)*	*8(47.1)*		
Moderate	*14(32.6)*	*5(29.4)*		
Severe	*4(9.3)*	*4(23.5)*		
Writing				
No	*12(27.9)*	*0(0.0)*	*^13.61*	*0.002***
Mild	*13(30.2)*	*2(11.8)*		
Moderate	*14(32.6)*	*8(47.1)*		
Severe	*4(9.3)*	*7(41.2)*		
Mathematics				
No	*13(30.2)*	*0(0.0)*	*^8.73*	*0.031**
Mild	*12(27.9)*	*6(35.3)*		
Moderate	*10(23.3)*	*4(23.5)*		
Severe	*8(18.6)*	*7(41.2)*		

Table8)Correlation between duration of disease and learning abilities and IQ scores.

Duration	*R*	*P*
IQ	*0.136*	*0.302*
Attention	*-0.102*	*0.439*
Auditory perception	*0.016*	*0.903*
Visual perception	*-0.039*	*0.766*
Movement	*0.091*	*0.487*
Memory	*-0.013*	*0.924*
Reading	*-0.007*	*0.959*
Writing	*-0.046*	*0.728*
Mathematics	*-0.182*	*0.165*

4 Discussion

Epilepsy as one of the most common neurological disorders, cannot be confined to epileptic seizures, epilepsy has been associated with difficulties in learning and behavioral performance in children, these problems have been attributed to an interplay of genetics, ongoing seizures, subclinical epileptiform discharges, postictal states, psychosocial issues, underlying abnormality of the brain, and the use of antiepileptic drugs (Bhise et al., 2009). Bailet and Turk(2000) reported that many factors have been considered as possible causes of these learning difficulties, including the seizures themselves , antiepileptic drug (AED) side effects , underlying brain abnormalities, preexisting learning disabilities , specific attentional and memory deficits, and psychological adjustment factors.

According to Austin & Dunn(2002) studies attempting to identify the cause of impairment of learning and behavioral function in children with epilepsy are limited by methodological shortcomings, including variability of seizure type and etiology, absence of baseline data, polypharmacy, and attributing disturbances to antiepileptic drugs by default . However it is clear that children with epilepsy experience educational problems more commonly when compared to the normal children of the same age(Bailet & Turk, 2000).

The rough prevalence of epilepsy and educational problems in children is nearly similar 0.5%(Aldenkamp & Mulder, 1999).

The current study is across sectional study assessing the Specific learning disorders among epileptic children with a comparative tool, (Attention ,Memory ,Auditory processing ,visual processing, motor skills, reading, writing and mathematics) were assessed in children with IQ 75 and more, and who also have no evidence of organic cause to the current presentation of learning disorders.

Children included in the study receive ordinary governmental education and are from low socioeconomic standards.The study was carried out in the outpatient clinic of child psychiatry in Benha mental hospital.

In the current study 60 children 41(68.3%)males & 19(31.7%)females with the main age 10.56 from (9-12)years old. These finding agree with Christensen et al (2005)who reported that the overall incidence of epilepsy is slightly higher in males than in females subject.

As shown in (table 2) 48.3% of them having focal epilepsy & 51.7% having generalized epilepsy ,58.3% treated with one drug and 41.7% were treated with multiple drugs with mean duration 43.03 monthes , 71.7% of them having their seizures controlled under the treatment they receive & 28.3% are not controlled , this may be due to several factors as the non compliance on treatment ,the sub therapeutic dosage and drug drug interactions.

Attention:

All types of epilepsy affects attention scores adversely(Bhise et al, 2009). In this study according to (table3) 51 child from 60 (85%) have attention problems 9(15%) mild , 16(26.7%) moderate & 26(43.3%) having severe inattention , with mean score(49.22). These findings followed our general hypothesis that Children with epilepsy have poor learning abilities and attention is one of them.

The attention problem scores is the highest among the 8 abilities that were measured which means that inattention is a significant problem in epileptic children and this agrees with the researchers suggested a disruption of attentional skills in children with epilepsy even if they don't have the diagnosis of comorbid Attention Deficit Hyper Activity Disorder (ADHD) (Williams , 2003). Williams et al., (2001) Stated in a study that involved comprehensive neuropsychological assessments including assessment of memory, attention, language, achievement, fine motor skills, executive function, visual motor integration, and behavior, that the neurocognitive skills of children with epilepsy were within expectations for their measured intelligence, attention skills only were found to be significantly below expectations for the children's measured ability.

table 9) Comparison between level of IQ regarding different scores of learning abilities.

IQ	*Very superior*	*Superior*	*Average*	*Dullness*	*Borderline deficiency*	*Test*	*P value*
Attention							
No	***3(42.9)***	***5(45.5)***	***1(3.7)***	***0(0.0)***	***0(0.0)***	***^27.09***	***0.001*****
Mild	***0(0.0)***	***2(18.2)***	***7(25.9)***	***0(0.0)***	***0(0.0)***		
Moderate	***3(42.9)***	***3(27.3)***	***7(25.9)***	***3(33.3)***	***0(0.0)***		
Severe	***1(14.3)***	***1(9.1)***	***12(44.4)***	***6(66.7)***	***6(100)***		
Auditory perception							
No	***5(71.4)***	***8(72.7)***	***8(29.6)***	***1(11.1)***	***0(0.0)***	***^23.51***	***0.004*****
Mild	***2(28.6)***	***3(27.3)***	***15(55.6)***	***3(33.3)***	***2(33.3)***		
Moderate	***0(0.0)***	***0(0.0)***	***3(11.1)***	***3(33.3)***	***2(33.3)***		
Severe	***0(0.0)***	***0(0.0)***	***1(3.7)***	***2(22.2)***	***2(33.3)***		
Visual perception							
No	***5(71.4)***	***9(81.8)***	***11(40.7)***	***1(11.1)***	***0(0.0)***	***^25.61***	***0.001*****
Mild	***2(28.6)***	***2(18.2)***	***13(48.1)***	***5(55.6)***	***2(33.3)***		
Moderate	***0(0.0)***	***0(0.0)***	***3(11.1)***	***3(33.3)***	***2(33.3)***		
Severe	***0(0.0)***	***0(0.0)***	***0(0.0)***	***0(0.0)***	***2(33.3)***		
Movement							
No	***6(85.7)***	***8(72.7)***	***14(51.9)***	***1(11.1)***	***0(0.0)***	***^22.66***	***0.004*****
Mild	***1(14.3)***	***3(27.3)***	***11(40.7)***	***4(44.4)***	***4(66.7)***		
Moderate	***0(0.0)***	***0(0.0)***	***2(7.4)***	***2(22.2)***	***1(16.7)***		
Severe	***0(0.0)***	***0(0.0)***	***0(0.0)***	***2(22.2)***	***1(16.7)***		
Memory							
No	***5(71.4)***	***4(36.4)***	***2(7.4)***	***0(0.0)***	***0(0.0)***	***^47.1***	***0.001*****
Mild	***2(28.6)***	***4(36.4)***	***10(37.0)***	***0(0.0)***	***0(0.0)***		
Moderate	***0(0.0)***	***3(27.3)***	***13(48.1)***	***2(22.2)***	***0(0.0)***		
Severe	***0(0.0)***	***0(0.0)***	***2(7.4)***	***7(77.8)***	***6(100)***		
Reading							
No	***1(14.3)***	***1(9.1)***	***8(29.6)***	***0(0.0)***	***0(0.0)***	***^30.94***	***0.001*****
Mild	***3(42.9)***	***9(81.8)***	***10(37.0)***	***1(11.1)***	***0(0.0)***		
Moderate	***1(14.3)***	***1(9.1)***	***9(33.3)***	***5(55.6)***	***3(50.0)***		
Severe	***2(28.6)***	***0(0.0)***	***0(0.0)***	***3(33.3)***	***3(50.0)***		
Writing							
No	***5(71.4)***	***1(9.1)***	***6(22.2)***	***0(0.0)***	***0(0.0)***	***^32.06***	***0.001*****
Mild	***1(14.3)***	***6(54.5)***	***8(29.6)***	***0(0.0)***	***0(0.0)***		
Moderate	***1(14.3)***	***2(18.2)***	***12(44.4)***	***3(33.3)***	***4(66.7)***		
Severe	***0(0.0)***	***2(18.2)***	***1(3.7)***	***6(66.7)***	***2(33.3)***		
Mathematics							
No	***4(57.1)***	***2(18.2)***	***7(25.9)***	***0(0.0)***	***0(0.0)***	***^42.43***	***0.001*****
Mild	***2(28.6)***	***6(54.5)***	***9(33.3)***	***1(11.1)***	***0(0.0)***		
Moderate	***0(0.0)***	***2(18.2)***	***11(40.7)***	***1(11.1)***	***0(0.0)***		
Severe	***1(14.3)***	***1(9.1)***	***0(0.0)***	***7(77.8)***	***6(100)***		

Memory:

People with epilepsy frequently complain of memory difficulties(Fisher et al., 2000), in this study 49of 60 (81.7%) of the children in the study suffer from memory problems 16 child 26.7% mild ,30 child(49.3%) with moderate and 15 child 25% with severe memory impairment, this comes in agreement with the previous studies.A community-based survey of over 1000 epilepsy patients in the United States revealed that Memory as one of the cognitive difficulties ranked highest on a list of potential concerns (Fisher et al., 2000). In another study, 54% of over 700 people with epilepsy regarded memory problems as a moderate to severe nuisance (Thompson and Corcoran, 1992). Many interacting factors may affect memory function in patients with epilepsy including the underlying neuropathology (Lencz et al, 1992), seizure activity (Jokeit et al., 2005), anticonvulsant medication (Motamedi and Meador, 2004), surgery (Te´llez-Zenteno et al., 2007), age (Lespinet et al., 2002), genetic background (Busch et al., 2007) and psychosocial factors (Elixhauser et al., 1999).

Auditory processing disorder

Auditory processing refers to an individual's ability to analyses or make sense of information taken in through the ears,This is different from problems involving hearing. An auditory processing deficit can interfere directly with speech and language, but can affect all areas of learning. There are some specific factors which may cause auditory processing difficulties for a student with epilepsy (Mitten ,2010).

The current study revealed that 63.3%(48 children from 60) have auditory processing disorders 41.7% (25of 60) mild ,13.3% (8of 60)moderate &8.3%(5 of 60) severe auditory processing disorder with mean (28.7). and these agrees with several studies just as Dawes, (2008)and Verleger and his collegues, (1997).

(Dawes, 2008) reported that difficulties may be directly linked to a student's medication and /or post seizure activity, or to an underlying neurological abnormality (Boyle, 2008).Also it may be due to what was demonstrated by Verleger and his collegues, (1997) as they stated that patients with idiopathic generalized epilepsy had delays in auditory tasks. these delays suggest a general delay of brain processes, similarly to the slowing observed in healthy aging, Patients with partial seizures had this general delay to a lesser extent.

Visual Processing disorder

Visual processing refers to how visual information is interpreted or processed by the brain. This is different from problems involving sight or sharpness of vision. Reading and maths are two core areas where visual processing skills are very important. There are some specific factors which may cause visual processing difficulties for a student with epilepsy (Devinsky , 2008).

In this study 57% of the studied sample having visual procession disorders 40% mild,13.3% with moderate & 3.3% having severe disorder and this agrees with what was observed by (Boyle,2008), difficulties may be directly linked to a student's medication and /or post seizure activity, or linked to an underlying neurological abnormality .

Motor skills

Delays in fine motor skills were noted in epileptic children (Williams , 2003).(Bhise et al, 2009) reported that the motor scores of the children with new onset epilepsy were below average in motor skills.

In another study applied on children with frontal lobe epilepsy (Hernandez and colleagues 2002) found that Motor deficits were more marked for tasks involving bimanual coordination and asymmetrical movements .

In the current study motor defecits was observed in 31 (51.7%) who had high scores in motor skills problems assessment most of them with mild affection 38.3%, 8.3% moderate & 5% severe.

Reading ,Writing and Mathematics

Academic weaknesses in children with epilepsy are not confined to any one area as underachievement has been found in a variety of subjects including math, spelling, writing to dictation, reading, reading comprehension, and general knowledge (Williams et al.,2003), reading and writing ability have also been identified by (Alessandro et al., 1990).

The risk for school failure appears highest in children with symptomatic epilepsy, while several studies have suggested normal achievement in children with low-severity epilepsy (Austin et al., 1999), In one study (Lindgren et al., 2004) when children with epilepsy examined for their writing abilities they gives lower scores in some aspects than the control group,In (2003) Jane Williams results indicated learning disabilities in math and written expression.

In the current study it was deducted that reading disorders was the most common of the 3 as 83.3% (50 children of 60) having between mild moderate & severe, most of them (23from 60) 38.3 mild, 31.3 moderate & the least percentage of them having the order in a sever degree 13.3%, the mean of their score (38.53).

Writing disorder comes in the 2nd rank after reading disorder (48 from 60)80% ,having the disorder 25% mild,36.7 moderate & 18.3 with severe degree the mean score for writing disorders is (40.92).

The least common is mathematics with percentage 79.3%(47 from 60) 30% mild, 23.3% moderate and 25% sever , the mean score is (39.5) which is in moderate range of affection.

Learning Disorders Regarding To Sex:

Statistically there is significant relation between sex from one side ,the IQ and learning disorders from the other side P value is highly significant < 0.005 in most of them (IQ ,Attention, Auditory &Visual procession, Reading ,writing) with scores & percentages are higher in

males than females , this agrees with the studies of Learning disorders incidence that indicated that learning disorders are significantly more common in boys than in girls , but the size of the difference varies across studies carried out in different countries.The influences that underlie sex differences in reading and writing disorders are unknown. In contrast, the prevalence of mathematics disorders is not significantly different between boys and girls(Moll et al., 2014).(Bailet & Turk ,2000) revealed that the use of sodium valproate & phentoin serves as a marker of relative risk academically as compared with carbamazebine, Cognitive and behavior problems on carbamazepine are relatively rare (Genton, 2000). Phsicians in Benha city usually avoids sodium valproate & phentoin in young females & children females for there known adverse effects just as polycystic ovarian syndrome in case of valproate & gingival hyperplasia ,obesity and hurstism (Jouko et al., 1996), and use carbamazepine instead of sodium valproate & phentoin , this may give an explanation why males affected more in this sample, In the old researches it was reported that pathologic conditions including learning & behavior disorders are 3 to 10 times more frequent among males than females of the same chronological age as the vulnerability of the male brain is more than that of females to stress & trauma(Bentzen ,1963).

Learning Disorders Regarding The Type Of Epilepsy:

In (table 5) the comparison between types of epilepsy regarding different scores revealed insignificant Statistical difference between IQ & learning disorders in Epileptic children , with generalized type Epilepsy & Epileptic children with focal type. In this sample.

Learning Disorders Regarding Type Of Therapy

According to (Table 6) The comparison between the 2 groups one of them receives monotherapy and the other receives multiple drugs revealed highly significant relation between IQ and the 8 abilities of learning we measured (Attention, memory ,Auditory& visual processing , motor skills ,writing ,reading and mathematics) from one side and the type of therapy on the opposite side and this agrees with the hypothesis of the study and with the previous researches , as according to(Aldenkamp et al., 2005) the use of polytherapy resulted in impaired vigilance (slowing in simple reaction-time tests), which also has some effect on educational achievement. Mula and Trimble(2012) stated that antiepileptic drugs (AEDs) may contribute to the cognitive deficits observed in patients with epilepsy, and have been shown to induce cognitive impairments in healthy individuals. However, there are few systematic data on the effects of AEDs on specific cognitive domains , a number of AEDs can impair working memory and attention. Canevini and colleagues (2010) studied the relationship between adverse effects of antiepileptic drugs and the number of co prescribed drugs and reported that the most common adverse effects was somnolence, followed by tremor, memory problems and visual disturbances.It is not uncommon for patients to suffer more from the toxicity burden imposed by overtreatment than by the manifestations of the disease. (Canevini et al., 2010).But we cannot ignore the fact that may be the severity of the epilepsy syndrome itself is the underline factor which led to polypharmacy and add on therapy as adverse effects are relatively common in a population of patients with medically refractory epilepsy (Canevini et al., 2010).

Learning Disorders Regarding The Current State OF Epilepsy Whether Controlled Or Not

As demonstrated in(table7) the relation between the controlled group (no fits under treatment) and the not controlled (still have seizures) statistically is highly significant as the not controlled group gives higher scores specially in Attention , reading , writing & mathematics ,with P value <0.01, this correlates with previous study that revealed children with ongoing seizures (are in contrast with patient that are seizure free) at much greater risk for developing learning impairment (Albert et al., 1999).This finding can be explained by the interplay between the following factors : subclinical epileptiform discharges, postictal states, psychosocial issues (eg: absence from the school), underlying abnormality of the brain, and the use of antiepileptic drugs specially (polypharmacy) (Bhise et al., 2009).

Cornaggia and Gobbi(2001)stated that Ictal changes in children with ongoing seizures (e.g., frequent absence seizures, nonconvulsive status epilepticus, sleep disturbances) may lead to significant difficulties in school performances due to interruptions of awareness in the classroom, moreover, silent nocturnal seizures may affect school performances the day after,Also Periictal changes, they may be prodromes during which some children experience changes in mood for hours or days before a seizure and these experiences are likely to affect both learning and behavior. Postictal changes like sleepiness, postictal depressive, manic, or schizophreniform paranoid changes may disrupt schooling(Cornaggia & Gobbi, 2001).

Learning Disorders Regarding The Duration Of Epilepsy:

Table (8) demonstrated that there is no significant statistical correlation between the duration of epilepsy and both learning disorders and IQ. Learning Disorders In Epileptic Children Regarding Intelligence Quotient (IQ): The IQ distribution of children with epilepsy is similar to that of the general pediatric population , exceptions to this finding are children who have significant neurological abnormalities or epileptic syndromes, such as Lennox–Gastaut, that are associated with moderate to severe cognitive delay (Williams , 2003).

In this study we have 60 children with the following IQ distribution, 7 with very superior (120-140), 11 has superior intelligence(110-119), 27 average intelligence (90-109), 9 dullness IQ (80-89), 6 with border line IQ(70-79). The mean IQ (101.17±15.28) & we excluded children with IQ 75 or less. Table (9) demonstrates the statistical comparison between IQ and learning abilities , the less the IQ the more the percentage of learning disorders in all abilities . with P value <0.01 which is considered highly significant results, This finding agrees with the Studies demonstrate that IQ is strongly related to learning (Gagne& Pere , 2001).

Mayes et al., (2009) stated that IQ explains 52% to 76% of variance in achievement in learning.IQ is related to rate of learning, students with higher IQs make significantly greater academic progress in reading and writing than children with lower IQs , regression analysis using IQ, attention, graph motor, and processing speed scores showed that IQ was the strongest single predictor of word reading, reading comprehension, math, and written expression (Mayes & Calhoun, 2007). Pind et al. (2003),mentioned that the correlation between intelligence and academic achievement appears to decline with age, being highest in primary school and lower in middle school and college , this gives an explanation to results of current study as age group the study conducted on (primary school children) are highly affected by their IQs.

Conclusion: Seizures was not the only problem that children with epilepsy are suffering from , they also have a great risk for developing learning disorders ,Attention disorder is the most common follwed by memory then auditory processing disorder , visual processin disorder and motor skills. In the academical learning disorders reading disorder is the most common , writing disorder comes in the 2nd rank and mathematics is the least common,Multiple factors increase the risk the duration of the disease the type of epilepsy, the severity of epilepsy and / or the type of therapy. The severity of epilepsy and / or the type of therapy these two factors were the most leading causes that the study verified. Several difficulties were faced while performing the current study some were related to the tool used and some were due to the studied sample : (a)The questionnaire used Learning & Developmental Disorders Rating Scales (LDDRS) Battery *(El-Zyat .,2007*) was too long , that made the parents of get bored (b) Assessing auditory and visual processing disorders through parent questionnaire were not the best choice as parents usually did not know how their children exactly processed their information.(c) Several parents did not teach their children special motor skills so children were wrongly graded.(d) Most of the studied sample were assessed after receiving medications and there was no assessment of their abilities before therapy .(e) In the present study several changeable factors were evaluated at the same time that made it unclear which of the factors was the leading cause of the finding for example both severity of epilepsy & poly pharmacy affect learning adversely but it was not clear which of them is the leading cause.

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5 References

Albert P. Aldenkamp , Wouterina CG. Overweg_P., John A. (1999).An opened non randomized clinical comparative study evaluating the effect of epilepsy on learning. J. Child Neurology 14(12):795-800

Albert P. Aldenkamp, , Rodenburg, MA, Geert Jan S., Anne Marie M., Deković, M. (2005). Psychopathology in Children with Epilepsy: A Meta Analysis.J. Pediatric Psychology 30(6):. 453-468.

Aldenkamp AP and Mulder OG (1999). Psychosocial consequences of epilepsy. *In;* Goreczny A, Hersen M, eds. Handbook of pediatric and adolescent health psychology. Boston: Allyn & Bacon:, 105-114.

Alessandro P , Picirilli M , Tiacci C, et al.,(1990). Neuropsychological features of benign partial epilepsy in children. Ital J Neurol Sci ;11:265–9.

American Psychiatric Association (2013). Diagnostic and Statistical Manual of Mental Disorders. 5th ed. Washington, DC .

Austin JK and Dunn DW (2002): Progressive behavioral changes in children with epilepsy .Prog Brain Res ; 135:419-27.

Austin JK, Dunn DW, Caffrey HM, Perkins HM, Harezlak J, Rose DF.(2002). Recurrent seizures and behavior problems in children with first recognized seizures: a prospective study. Epilepsia; 42: 1564-1573.

Bailet LL and Turk WR (2000). The impact of childhood epilepsy on neurocognitive and behavioral performance: A prospective longitudinal study. Epilepsia; 4: 426-431.

Boyle, R.(2008) ' The School Years and Beyond' Epilepsy 360º March, pp 8-11

Busch AJ, Barber KA, Overend TJ, Peloso PM and Schachter CL(2007).Exercise for treating fibromyalgia syndrome . 17;(4). Cochrane Database Syst Rev.:CD003786.

Cornaggia CM and Gobbi G(2001). Learning disability in epilepsy:definition and classification. Epilepsia;42(suppl. 1):2–5.

Devinsky, O. (2008). Epilepsy: Patient and Family Guide .Demos Medical Publishing :New York.

El-Zyat(2007).Developmental Disorders Rating Scales(LDDRS) Battery.

Elixhauser A, Leidy NK, Meador K, Means E and Willian MK.(1999). The relationship between memory performance, perceived cognitive function, and mood in patients with epilepsy. Epilepsy Res 37:13–24.

Ettore B.. Cesare M. Cornaggia,Maurizio E. (2001). Proposal for a multicenter study on epilepsy and learning disorders in children Epilepsia 42(s1): 10–12.

Frances Bentezen (1963). sex ratios in learning & behavior disorders.American J Orthopy.33(1):92-98

Gagne, F.,,St Pere, F. (2001). When IQ is controlled, does motivation predict achievement?. Intelligence, 30: 71–100.

Genton P(2000). When antiepileptic drugs aggravate epilepsy Brain Dev. ;22(2):75-80.

Jakob C..Marianne J. ,Henning A.,Mogens F. , Per Sidenius (2005) Ginder differences in epilepsy ,Epilepsia, 46,(6):956-960

Jouko I. T. Isojärvi, Timo J. Laatikainen, , Mikael Knip, Arto J. Pakarinen, Kaisa T. S. Juntunen and Vilho V. Myllyla (1996). Obesity and endocrine disorders in women taking valproate for epilepsy Annals of Neurology 39(5): 579–584.

Kristina Moll, Sarah Kunze, Nina Neuhoff, Jennifer Bruder, Gerd Schulte-Ko¨ rne(2014). Specific Learning Disorder: Prevalence and Gender Differences PLOS ONE 9 (7): e103537.

Lencz T, McCarthy G, Bronen RA, Scott TM, Inserni JA, Sass KJ, Novelly RA, Kim JH, Spencer DD. (1992). Quantitative magnetic resonance imaging in temporal lobe epilepsy: relationship to neuropathology and neuropsychological function. Ann Neurol 31:629–637.

Lespinet, O., Wolf, Y.I., Koonin, E.V., Aravind, L. (2002). The role of lineage-specific gene family expansion in the evolution of eukaryptes. Genome Res. 12(7): 1048--1059.

Lindgren S, Kihlgren M, Melin L, Croona C, Lundberg S, EEG- Olofsson O. (2004). Development of cognitive functions in children with rolandic epilepsy. Epilepsy Behav 5:903–910.

Marco Mula , Michael R. Trimble (2009). Antiepileptic drug- induced cognitive adverse effects CNS Drugs, 23,(2):121-137.

Maria Paola Canevini, yGiovambattista De Sarro, zCarlo Andrea Galimberti, xGiuliana Gatti, Laura Licchetta, xAmbr Malerba, Giancarlo Muscas, Angela La Neve, yyPasquale Striano, and zxEmilio Perucca(2010). Relationship between adverse effects of antiepileptic drugs, number of coprescribed drugs, and drug load in a large cohort of consecutive patients with drug-refractory epilepsy Epilepsia, 51(5):797–804.

Maria Teresa Hernandez , Hannelore C. Sauerwein Isabelle Jambaque´ , Elaine De Guise Francine Lussier, Anne Lortie, Olivier Dulac and Maryes Lassonde (2002).Deficits in executive functions and moto coordination in children with frontal lobe epilepsy .Neuropsychologia 40:348-400.

Massimiliano Beghi, Cesare Maria Cornaggia, Barbara Frigeni and Ettore Beghi (2006). Learning disorders in epilepsy. Epilepsia 47 (s2): 14–18.

Mayes, S. D., and Calhoun, S. L. (2007). Learning, attention, writing, and processing speed in typical children and children with ADHD, autism, anxiety, depression, and oppositional-defiant disorder. Child Neuropsychology, 13:469–493.

Mitten,R. (2010). 'Diagnosing and Solving School Learning Disabilities in Epilepsy' EPMagazine August Edition pp 33 -35.

Motamedi GK and Meador KJ (2004). Antiepileptic drugs and memory. Epilepsy Behav. 5(4):435-9.

Piers Dawes , Dorothy V.M. Bishop , Tony Sirimanna , Doris-Eva Bamiou (2008): Profile and aetiology of children diagnosed with auditory processing disorder (APD). 72 (4): 483-489.

Pind, J., Gunnarsdo´ttir, E. K., , Jo´hannesson, H. S. (2003).Raven's standard progressive matrices: New school age norms and a study of the test's validity. Personality and Individual Differences, 34:375–386.

Rhiannon Corcoran, Pamela Thompson (1992). Memory failure in epilepsy: retrospective reports and prospective recordings. Seizure 1(1): 37–42.

Robert Fr. P (2000). Epilepsy from the Patient's Perspective: Review of Results of a Community-Based Survey.Epilepsy & Behavior,1(4): S9-S14.

Rolf Verleger , Christoph Lefe`bre , Ruth Wieschemeyer, Detlef Ko¨mpf(1997). Event-related potentials suggest slowing of brain processes in generalized epilepsy and alterations of visual processing in patients with partial seizures. Brain Research 5 :205–219.

Vikram v Bhise,Gail D Burack,David E and Mandebaum (2009).Baseline cognition, behavior, and motor skills in children with new- onset, idiopathiepilepsy.Develop. Medicine & Child Neurology52(1):1-5,

Williams J (2003). Learning and behavior in children with epilepsy. Epilepsy Behav ; 4:107-111.

Williams J, Phillips T, Griebel M, et al (2001). Factors associated with academic achievement in children with controlled epilepsy. Epilepsy Behav 2:217–23.