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Epilepsy and Schooling: A Review of The Literature

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Introduction

Child epilepsies are a group of chronic conditions. There are many epileptic syndromes in children, and the presence of neuropsychological and psychomotor disorders is frequently reported in them **[1]**.

Epilepsy is a very common disease in sub-Saharan Africa with prevalence ranging from 3.43 to 49% **[2]**. In Congo Brazzaville, the prevalence in schools is 12.8% in children aged 6 to 16 years **[3]**. In Senegal, the prevalence in schools varies by locality. Estimated at 21 ‰ among children aged 3 to 10 years in the Dakar and Thiès regions, it is lower in Saint-Louis with 2.64 ‰ **[2]**. In Benin it is 7.9 ‰ with predominance among female subjects; and an increase as a function of age **[4]**.

The schooling of children with epilepsy still faces many obstacles and difficulties whereas most other chronic diseases of the child, it is well codified and accepted. For teachers, one case of epilepsy in the classroom gives more concern and concern than another condition **[5]**. For the child with epilepsy, schooling is still too often disturbed with difficulties of integration into the class group, learning and behavior. Long-term psycho-social risk is important **[6]**. More than 50% of children developing epilepsy will have long-term academic difficulties, behavioral disorders, psychiatric disorders or a lower quality of life than children of the same age. Studies show significantly lower school performance and intelligence quotient in children with epilepsy **[7]**. Epilepsy is a real public health problem. Children living with epilepsy suffer from psychological and sociocultural problems that are obstacles to their development and social integration **[8]**.

The interest of this review lies in the impact that epilepsy has on the schooling of the child, its adaptation within the society as well as the repercussion of its treatment on its learning.

Epilepsy and the School Environment

Children with idiopathic generalized epilepsy or partial epilepsy are more likely to be enrolled in mainstream education than children with cryptogenic or symptomatic generalized epilepsy **[9]**. Studies have shown that epilepsy in children is a risk factor for school failure and initially poorer social integration, under-qualification and higher risk of unemployment **[10, 11]**. This failure is multifactorial **[12]**, sometimes of insidious, undetectable appearance. In France, for example, school progression from cycle to cycle is regular and grade repetition is rare. Difficulties are not always pointed out,

and when they are, they often seem final, irremediable. Ibekwe and Bulteau **[10, 12]** assessed the intelligence quotient (IQ) and grade level of epileptic children. The school level was associated with several factors namely: IQ, epileptic syndrome, age of onset, duration of epilepsy and number of AEDs. Sex, age, and neuropsychological assessment had no impact on schooling.

The relationship between the LICE classification (1989), IQ and schooling has been the subject of very few studies. Igarashi et al. **[13]** reported an average IQ around 85 in a population of 31 children aged 6 to 18 years with idiopathic epilepsy. Sturniolo et al **[14]** found an average IQ of 103 in a population of 41 children with idiopathic generalized epilepsy. All of her children were in mainstream school, 61% of them had poor school results with various behavioral problems (hyperactivity, aggression ...). In this study **[12]**, the average IQ of children with idiopathic generalized epilepsy is lower than in the Sturniolo et al study, probably because children were out of school for persistent seizures with inadequate medical treatment. Sounga Bandzouzi **[15]** showed that 48.8% of patients with idiopathic generalized epilepsy and 33.3% idiopathic focal epilepsy had academic difficulties. Ndiaye and Paul-Cédric **[2-16]** report that 34.1% and 49% of children with idiopathic epilepsy had academic difficulties.

IQ is very low in children with chronic symptomatic epilepsy, but remains stable in idiopathic epilepsies. Children with idiopathic or cryptogenic epilepsy "epilepsy only" have mostly normal intelligence and are educated normally. Three-quarters are free of seizures within two years of diagnosis with or without continued treatment **[17, 18, 19]**. However, these children often have academic difficulties. This notion is however classic but the care of these children remains insufficient and poorly adapted. Close collaboration with teachers is essential **[18, 19]**.

A survey evaluating the school path of 136 children with epilepsy shows that 72% of them have academic difficulties, 73% of behavior disorders with repetitions for 33% **[19, 20, 21]**. The origin of these problems is certainly multifactorial. The psychosocial family context is an important element: for example, the ability of the family and the child to adapt to epileptic illness in its infancy seems to be an important prognostic factor for school performance **[18, 22, 23]**. Intellectual abilities are generally preserved but with significant dissociations in favor of verbal skills, performances being diminished **[19]**.

Specific cognitive impairment has been demonstrated in several studies of targeted populations of epileptic children: temporal epilepsy reading disorders, attention deficit disorders, and short-term memory difficulties in centrotemporal epilepsy **[22]**.
Studies indicate that this failure is not strictly correlated with the severity of epilepsy or the frequency of seizures. There may be cognitive disorders in idiopathic epilepsies that may explain it **[23]**. Thus all his observations relativize the notion of benignity of idiopathic epilepsies **[15]**.

Another problem is that of school achievement difficulties. It even concerns children with epilepsies without other neurological problems, called "epilepsy only" **[10]**. These children who are normally educated have generally preserved intellectual capacities, but their learning can be slow and laborious, marked by a lack of understanding of the teacher and the suffering of the child. The reasons for this failure are complex: cognitive and psychodynamic. They must be elucidated to find out with the teacher and the various partners the specific care of the child, the support of the parents and the necessary school and educational adaptations. Absenteeism is important at the beginning of the illness. It may persist depending on the drug resistance, family anxiety or fatigability of the subject. Behavioral disorders can also be at the forefront and cause rejection of the child by peers.

Orientation to long-term secondary education is rarer: 33% of epileptic children aged 12 to 18, complete secondary education compared to 68% in a control population **[24]**. The risk of school failure is important. A higher rate of repetition in the epileptic child is reported than in the general population. But this rate is also higher than in children with other chronic conditions such as asthma or diabetes **[15, 24]**. Thus epilepsy represents a significant risk of deschooling and future under-qualification.

Epilepsy and Learning Disorders

It is estimated that half of children with epilepsy have some type of learning problem. The problem of learning for children with epilepsy ranges from widespread cognitive delay to light and very specific learning problems. Most often it is: inattention, short-term memory impairment, slower processing speed **[25]**.

They affect academic performance in reading, writing and mathematics. They can cause frustration and increase behavioral and self-esteem problems, as the child sees his peers doing stains that he cannot perform or that he does more slowly **[19]**. In Senegal **[15]** Learning difficulties were observed and documented by school failure in 45% of patients.

In a public health survey of 11,160 children aged 6 to 17, Carlton-Ford et al [19] reported that 32 children had active epilepsy and 89 had non-active epilepsy. Compared to the population without epilepsy, the two epileptic populations have a greater frequency of learning difficulties (respectively 69% and 35% versus 7%), of developmental delay (22% and 25% versus 4%) and of oral language delay (20% and 10% versus 4%). Eighteen (18%) of children with epilepsy have a reading delay of at least two years compared to 6.8% of children in the general population **[26]**. Parents, meanwhile, report slowness and attentional difficulties in 60 to 70% of epileptic children attending school normally **[27]**. And 42% of epileptic children are described by their teachers as inattentive, distracted

students. School difficulties are identified in various fields such as reading, mathematics, vocabulary and general knowledge **[25]**.

Billard et al **[28]** in his survey of 1062 children enrolled in CE1 to identify the deficit in reading skills of his children. The individual reading tests identified 100 children with skills deficit and 31 children "intermediate". Stratification defined a "control" group of 50 "normolector" children enrolled in the same class.

Each group received medical assessment and cognitive functions (verbal, nonverbal and phonological) and socio-economic and behavioral data collection. A multivariate logistic regression determined the variables that most differentiated weak or good readers. Children with higher reading difficulties were older due to repetition ($p < 0.06$). Sixty-eight percent of low-income readers (FL) were enrolled in very poor areas, 28% in moderately disadvantaged areas and 4% in normally favored areas. The distribution was identical among good readers (BL) because of the stratification methodology. None of the BL children or normal readers (NL) redoubled CP. Sex and lateralization was identical in the 3 groups. In the cohort of 181 children, after excluding mental deficiencies, FL children and NL had a nonverbal and mostly verbal score, significantly lower than BL.

For the general population, all reading scores were significantly more deficient in children with a history of chronic disease ($p < 0.001$). For the FL group only, no oral or written language score differentiated children with speech therapy. In the BL group, only speech reading ($p < 0.04$) and oral language ($p < 0.02$) were lower in children with speech-language pathology, but their scores were much higher than those of non-FL children. Reeducated.

These results lend additional weight to the importance of focusing on phonological skills rather than intelligence to detect and help children with learning difficulties in this early learning of reading. Vocabulary and language skills are particularly weak in this largely disadvantaged population; they do not discriminate against children learning to read from others. Inattention is the second factor involved, conduct disorders and / or hyperactivity play no role.

If these data are consistent with the frequent association of ADHD -difficulties in reading **[29]**, they focus on the attention factor of ADHD and not on the hyperactivity and disorders behavior disruptive, aggression that does not fit into account line **[30, 31]**.

Data on the reading, spelling and numeracy skills of this cohort of 1062 children confirm the results of French sociological or school sources **[32, 33, 34]**, as well as those from Anglo-Saxon literature **[35, 36]**. School skills are strongly influenced by medical history and socio-cultural background. Nevertheless, even in a disadvantaged socio-cultural environment, the majority of children learn to read. It is therefore very important to determine the factors accounting for this disparity and their relationship, in order to effectively combat school failure in this particularly sensitive population. The probability of a child having normal schooling is very high for idiopathic epilepsy, but much lower in symptomatic epilepsies.

Children with frontal epilepsy have poor performance in verbal fluency tasks. Children with left temporal epilepsy are characterized by low scores on naming and vocabulary tests. If these language disorders are considered from a developmental point of view, children with epilepsy may also have a language delay **[19, 31]**.

A persistent deficit in the acquisition of phonetic contrasts has been reported in children with left frontal epilepsy. Learning the written language is also difficult for these children. More than 20% of children with generalized and / or partial epilepsy have a reading delay of 1 to 2 years, despite a normal intellectual level. Children with left temporal epilepsy have specific difficulties in reading. They manifest themselves on irregular word reading tasks, and in segmentation tasks **[9, 19, 31]**.

Thus, children with frontal epilepsy lack strategy in intentional memorization tests. They therefore encounter difficulties in list-learning tests, and may even have a "burn-out" curve during successive tests. Their mnemic difficulties are significant here, because serial learning tests require planning.

The most severe memory disorders, however, are those suffered by children with temporal epilepsy. This is related to the particular implication of the limbic system (localized in the temporal lobe) in the phenomena of encoding and memorization **[37]**. In addition, children with temporal epilepsy have memory deficits that are more dependent on the perceptive nature of the material. Thus, those with left temporal epilepsy are characterized by a verbal memory disorder, poor reading performance, which can reduce the ability to learn words and stories. In the case of right temporal epilepsy, children present difficulties in the memory of the physical characteristics of an object **[38]**. The reported memory difficulties suggest both dysfunctions related to initial difficulties of encoding, or a lack of consolidation and / or memory recovery **[39]**. Their academic difficulties are undoubtedly the principal clinical expression of their mnemic insufficiency. There is, however, a diversity in the nature and severity of disorders according to the topography of epilepsy **[38, 39]**.

The epileptic child is described as slow and clumsy. In certain epileptic syndromes, such as myoclonic epilepsies, the frequent occurrence of seizures is often accompanied by disturbances of balance, lack of motor coordination, low manual dexterity or even attacks of oral-facial praxias. . In partial epilepsies, particularly those of the parietal lobe, a change in laterality is sometimes observed at the time of an aggravation of epileptic disease **[26]**. Left-handedness is

overrepresented in the population of severe epilepsies (which are usually associated with low IQ). Left-handedness can reach 20%, and it reflects a pathological change in laterality **[32]**.

Neuropsychological evaluation often reveals low motor speed in children with epilepsy. This can affect the performance of certain visuo-motor tasks. The estimate of IQ may be biased. The Weschler-scale code test is thus often "dropped", especially in the case of combination therapies. The topographic impact of epilepsy also plays an important role **[32]**.

Children with either temporal lobe epilepsy or absences show that their performance is slightly lower than standard on many "frontal" tasks. This suggests, according to the authors, that factors related to epilepsy itself and its treatment, such as fluctuations in attention and / or decreased alertness, can affect the performance of these children **[17]**. Attention problems are frequently reported in children with symptomatic, drug-resistant epilepsy, as well as in idiopathic epilepsies. There are also more attention problems in patients with generalized seizures. In addition, some epileptic syndromes are more often associated with attention deficit disorder with or without hyperactivity (TDA / H). Memory impairments, reading difficulties, specific learning disabilities, attention disorders, and planning deficits are frequently reported in children with epilepsy **[9]**.

The goal of antiepileptic drugs is to control seizures. The ideal would be to do this without compromising the quality of life of patients, but this remains difficult because of the adverse effects of antiepileptic drugs. It should be noted, however, that the proportion of patients with adverse effects when treated with antiepileptics increases with the number of drugs used. Thus polytherapy begun at a young age allowing in certain cases to stabilize certain epileptic seizures, leads to a significant reduction in IQ **[31]**. It is thus a source of deschooling because of the aggravation of the cognitive disorders that it could generate. The stabilization of epilepsy with monotherapy for children would be very beneficial for their schooling. Combination therapy would be indicated for children with symptomatic epilepsy because they already have a damaged brain, as has been demonstrated in an animal model **[40]**.

Epilepsy and Everyday Life

Epilepsy is a disease whose risk of occurrence of a crisis, whatever the frequency of seizures in the patient, is a source of permanent concern. The worry is even more present when the frequency of attacks is rare. The social disability of the disease depends on how it is experienced by the patient and his family. Thus, anxiety, guilt, parental overprotection are commonplace, even in benign epilepsies **[38]**.

All this can lead to irritability and emotional excesses in the child. These emotional factors then affect the cognitive and academic efficiency of the child **[41]**. Note that these social repercussions depend on the severity of the illness, the nature and frequency of the seizures, the associated handicaps and the age of onset. Finally, the repercussions are different if the patient has the psychological possibilities to recognize and accept his illness, or on the contrary if he refuses it, in which case the social impact is sometimes increased **[38,41]**.

Due to the unexpected nature of seizures, epilepsy imposes daily constraints. Respecting the hours of sleep is an integral part of the treatment of epilepsy. This rule is particularly important in idiopathic generalized epilepsies, in which chronic or acute sleep deprivation is an important factor in triggering seizures. In these epilepsies, a poor lifestyle may be responsible for a drug resistance chart **[41]**. The patient's place of residence must be arranged in order to avoid the consequences of a prolonged fall or loss of consciousness (trauma or burns). Video games and television can sometimes cause seizures in predisposed subjects.

These patients have to watch television more than a meter from the screen, in an illuminated atmosphere **[42]**. We should stop watching the screen as soon as symptoms appear (visual disturbances, myoclonus ...). The risk of drowning during a bath is high. It is therefore recommended that patients take a shower. Epilepsy is a disease whose risk of occurrence of a crisis, whatever the frequency of seizures in the patient, is a source of permanent concern. The worry is even more present when the frequency of attacks is rare. The social disability of the disease depends on how it is experienced by the patient and his family. Thus, anxiety, guilt, parental overprotection are commonplace, even in benign epilepsies. All this can lead to irritability and emotional excesses in the child. These emotional factors then affect the cognitive and academic efficiency of the child **[39]**. Note that these social repercussions depend on the severity of the illness, the nature and frequency of the seizures, the associated handicaps and the age of onset. Finally, the repercussions are different if the patient has the psychological possibilities of recognizing and accepting his illness, or on the contrary if he refuses it, in which case the social impact is sometimes increased.

Conclusion

The school allows a psycho affective fulfillment and conditions the socio-professional future of the children. However, the child with epilepsy is most often subject to difficulties of school integration in more than 50% of cases. The schooling of the epileptic child and the neuropsychological profile depend on the epileptic syndrome. Indeed, a given epileptic syndrome involves a specific neural network that affects the cognitive functioning more or less precisely. Memory problems, reading difficulties and frequent learning disabilities are a source of academic failure. A polytherapy begun at a young age is a factor of poor school prognosis.

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