Electroencephalographic Aspects Of Cerebral Palsy In Children In Abidjan, Côte D'ivoire

Aspects Electroencephalographiques Dans Les Paralysies Cérébrales De L'enfant A Abidjan En Cote D'ivoire

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Abstract

Introduction: Our study aimed to analyze the electroencephalogram performed in patients with cerebral palsy (CP). It revolved around the description of socio-demographic, clinico-radiological and electroencephalographic characteristics.

Methodology: This was a cross-sectional study with a descriptive and analytical aim. It took place over a period of two and a half months, extending from August 1st to October 15th, 2021. It included 35 patients with CP.

Results: The most represented age group and gender was that of the male infant. Children with motor and language delay were represented in 60% and 71% of cases, respectively. Epileptic seizures were found in ¾ of our respondents. The background rhythm was abnormal in 20%. Graphoelements were present in 57% and dominated by spikes and slow waves.

Conclusion: Our study shows that EEG in children with CP is very often abnormal.

Keywords: Cerebral palsy -Electroencephalogram- Epilepsy.

Résumé

Introduction: Notre étude avait pour objectif d'analyser l'électroencéphalogramme réalisé chez des patients présentant une paralysie cérébrale. Elle s'articulait autour de la description des caractéristiques sociodémographiques clinico-radiologiques et électroencéphalographiques.

Méthodologie: Il s'agissait d'une étude transversale à visée descriptive et analytique . Elle s'est déroulée sur une période de deux mois et demi, s'étendait du 1er août au 15 octobre 2021. Elle a permis d'inclure 35 patients atteints de PC.

Résultats : La tranche d'âge et le genre les plus représentés était celle du petit enfant de genre masculin. Les enfants présentaient un retard moteur et du langage dans 60 et 71% des cas. Les crises épileptiques étaient retrouvées chez ¾ de nos enquêtés. Le rythme de fond était anormal dans 20% des cas. Des graphoéléments étaient présents dans 57% des cas et dominées par les pointes, ondes lentes et pontes-ondes.

Conclusion : Il ressort de notre étude que l'EEG de l'enfant atteint de PC est très souvent anormal.

Mots clés : Électroencéphalogramme-Épilepsie -Paralysie cérébrale.

Introduction

First cause of motor disability in children, cerebral palsy is a relatively common condition with a prevalence of 2 to 3 cases per 1000 live births [1] . Even if the motor clinical expression is often dominant, other disorders including epilepsy can compromise the psychomotor and cognitive development of children with CP. Epilepsy has a high incidence in children with cerebral palsy. It can affect up to 90% of children and results in clinical and syndromic polymorphism. Analysis of electroencephalograms (EEG) reveals electrical abnormalities without clinical manifestations in nearly 40% of cases [2,3]. A recent review of the literature on cerebral palsy in the world, then in Africa, highlighted several African studies on the association between cerebral palsy and the occurrence of epilepsies, but very few are mainly interested in electroencephalographic data [4]. Our study therefore set out to analyze the clinical and electroencephalographic aspects in patients with cerebral palsy.

Methodology

This was a descriptive and analytical cross-sectional study carried out over a period of two (02) and half months from August 1st to October 15th, 2021. The study took place in the neuropediatric departments and the neurophysiology laboratories of Treichville University Hospital and Mother-Child Hospital of Bingerville. The study involved all children with cerebral palsy received in consultation or in these laboratories during the study period and whose caregivers gave their informed verbal consent. To be included in our series, the child had to present cerebral palsy, without any other justifiable pathology of epileptic seizures or abnormal cerebral activity and performed an EEG. Were excluded from our study children with CP, presenting with a fever or a biological inflammatory syndrome or metabolic disorders at the time of registration or in consultation. The investigation took place into two phases; a semi-directed phase with the support person for the first part dealing with socio-demographic and clinical data; then, a second phase after the recording and interpretation of the tracing by two experimented neurologists. This phase is carried out by the investigator considering the electroencephalographic results. Open questions and multiple-choice questions were asked. The answers and proposals chosen were recorded by the interviewer on a sheet. The analysis was essentially descriptive, covering sociodemographic, clinico-radiological and electroencephalographic data. All information was collected using CSPro software then analyzed with STATA 13 and described by graphs via Excel 2010 and the statistical tests used were Pearson's Chi2 test and Fischer's exact test for possible factors associated with a significance level $p \leq 0.05$. Thirty-five (35) patients were thus investigated. The results have been disseminated in such a way as to respect the anonymity of the participants. The administrative authorities were informed and gave their consent for the study.

Results

Socio-demographic data

The average age of the population was 54 months or 4.55 years, with extremes of 9 months and 16 years. The most representative slice was that of the small child. Two-thirds of the children recruited were male and not in school. Of those enrolled, 18% were in special education. Of the 35 patients selected, 31 were of Ivorian nationality, i.e., 88.5% and distributed as follows: 42% Akans, 32% Mandés and 26% Krous.

Clinico-radiological data

The notion of consanguinity was found in about 6% of cases and 23% recognized similar cases in the family. In 60% of cases, motor development was delayed. Language delay was observed in 71% of cases. Epileptic seizures were present in ¾ of cases. Concerning the type of seizure, 48% had a generalized onset, 35% with an unknown onset mode and 17% with a focal onset. The seizures occurred in 52% of cases while awake, then in 25% of cases during sleep. Critical motor manifestations are dominated by tonic-clonic seizures, followed by tonic seizures. The cerebral palsies were dominated by the spastic type followed by the dyskinetic and ataxic types (see figure 1). Brain imaging including magnetic resonance imaging (MRI) performed by 43% of patients showed abnormalities in 74% of cases. Atrophic lesions accounted for 52% of anomalies followed by anoxic-ischemic lesions in 35% of cases.

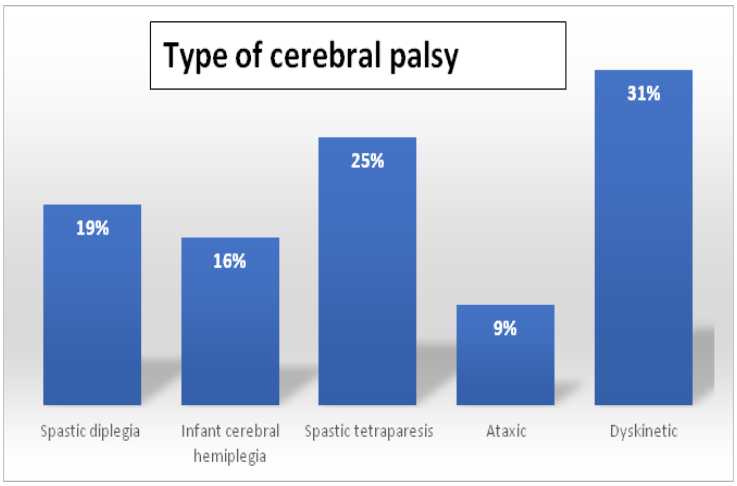

Figure 1: Distribution by type of cerebral palsy.

Electroencephalographic data

All patients had performed a sleep EEG. The background rhythm was abnormal in 20% of cases. Sleep was spontaneous in 33 out of 35 respondents. Sleep figures were present and abundant in 82% and 74% of cases respectively. The background rhythm was normal, disorganized and slowed in 80%, 9% and 11% of cases respectively. Paroxysmal grapho-elements were present in 57% of respondents (see Figure 2). The anomalies observed were slow waves in 53% of cases followed by spikes in 47% of cases, then spike-waves in 26% of cases. Other anomalies included steep-fronted waves and frontal positive spikes. The abnormalities were asymmetrical in 85% of cases.

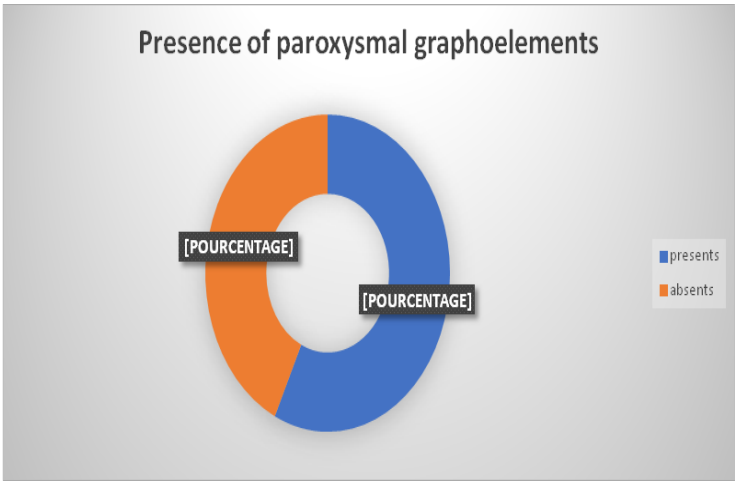

Figure 2: Distribution of respondents according to the presence of paroxysmal graphoelements.

Discussion

The most represented age group within the study population was that of the small child, i.e., between 3 and 6 years old with 54% with an average age of 5.44 years and extremes of 9 months and 15 years old. These data are similar to those of Kouna-Ndouongo and al. in a case-control study of 120 patients concerning the associated factors and therapeutic management of cerebral palsy in children in 2014 in Gabon who found an average age of 5.32 years [4]. Our results could be explained by the fact that not only the common age of diagnosis of CP is around 5 years old according to recent data but also by the delay in diagnosis and therapeutic management [5,6]. In our series, two-thirds were male and uneducated. Kouna Ndouongo and al. in Gabon in 2014 and Mbonda and al. in Cameroon found similar data at 53.3% and 57% respectively. This same male predominance, found by Doumbia and al, is known and described in the global epidemiology of this condition [4,6,7].

A third of the respondents were educated, including 18% in special education. This low rate of schooling could be explained by the fact that children with CP have in one out of two cases an associated mental and/or cognitive deficiency which hinders schooling [1,8]. These data were also found by Bruck and al. in Brazil in 2000. Similarly, a reduced availability of specialized centers would justify our results [9].

Of the 35 patients selected, 31 were of Ivorian nationality, i.e., 88.5% and distributed as 42% Akan, 32% Mandé and 26% Krou. This work was carried out in Abidjan in the lagoon region where this group is the majority, so there is a probable geographical link that would explain these results. The notion of consanguinity was present in about 6% of cases and 23% recognized similar cases in the family. Al-Rajeh and al. in Saudi Arabia found a direct implication of consanguinity and family history of PC [10]. In 60% of cases, motor development was delayed. Language delay was observed in 71% of cases. Kouna N'Douongo in Gabon found 60% of children with motor disorders in his series [5]. The definition of CP reporting permanent motor disorders would corroborate our results at the motor level [1,11]. As for the language delay, it was found in several African and European series. Thus, Mbonda and al. in 2011 in Cameroon, Sadowska and al. in 2020 in Poland and Kouna Ndouongo and al. in 2014 in Gabon found it respectively in 48%, 50% to 90%, 91%. These figures attest to the almost constant and significant presence of language disorders which constitute one of the main described comorbidities of

this condition [1,4,5,7]. Epileptic seizures were present in 75% of cases. Our data are superior to those of Mbonda and Doumbia which presented respectively 41.5% and 61%. Our figures could be explained by the fact that the recruitment concerned neurophysiology laboratories where most of the time the EEG requested followed stereotyped, repetitive and paroxysmal manifestations whose epileptic origin was sought [12,13]. In addition, epilepsy was also one of the main comorbidities associated with CP according to recent studies [1-3,5,7]. As for the type and moment of seizure, 48% had a generalized onset, 35% with an unknown onset mode and 17% with a focal onset; crises occurred in 52% of cases on standby followed by sleep in 25% of cases. Mbonda and al. in 2011 found generalized seizures in 68% of cases. Our results were lower and this could be explained by the small sample size and the fact that some seizures occurring during sleep or without the knowledge of caregivers could not be assessed [7]. Motor critical manifestations were mainly represented in decreasing order by tonic-clonic, tonic, clonic seizures and spasms. Lajungu and al. in 2006 in Nigeria also found tonic-clonic seizures in 53.8% of cases, focal seizures and spasms in 15.4% [3]. Niedemayer justified this finding by the fact that generalized epileptiform activity can be attributed to rapid secondary bilateral synchronization, such as that sometimes induced by a frontal focus. Sometimes a deep subcortical brain injury can also generate this type of epileptiform activity [3,14].

The main type of spastic CP was spastic tetra paresis. These data are similar to those of Mbonda and al in Cameroon in 2011 who found a predominance of spastic tetra paresis in half of the cases [7]. Indeed, taking into account the recent SCPE classification, the preponderant type of CP is the spastic type [15]. MRI is the reference imaging for assessing lesions in CP. About 75% had radiological abnormalities. These data were similar to Sadowska and al. in Poland in 2020 who found more than 80% of imaging abnormalities in this condition [1,5]. Atrophic lesions accounted for 52% of anomalies followed by anoxic-ischemic lesions in 35% of cases. Indeed, in developing countries, the causes of CP are dominated by cerebral suffering and severe asphyxia at birth with its anoxic corollary [1,4,16,17]. In a recent Ivorian study in 2018, Doumbia and al. presented cerebral suffering as the main perinatal etiology [12]. Our respondents had all benefited from a sleep EEG. Background rhythm was normal in 80% of cases and sleep figures were reduced in 26% of cases. Paroxysmal grapho-elements were found in 57% of respondents, asymmetrical in 85% of cases and included slow waves in 53% of cases followed by spikes at 47% then spike-waves at 26%. Other abnormalities included steep-fronted spikes and frontal positive spikes. In a Japanese sleep EEG study in 1985, 53% had EEG abnormalities, 22% had a significant reduction in sleep figures, and 78% had background rhythm disorganization [18].

More recent work of black African children with CP in Senegal in 2012 reported focal and/or diffuse paroxysmal abnormalities in 43% of cases [19]. In a Swedish study in 2020, 48% had a normal EEG, 43% had generalized paroxysmal abnormalities, 33% of the abnormalities were asymmetrical, and 10% had a slow background rhythm [2].

Conclusion

This study provided a general overview of the sociodemographic, clinico-radiological and electroencephalographic data of CP. The small male child was the main one concerned by electroencephalographic particularities. The background rhythm was mostly normal. Paroxysmal graphoelements were frequently found, dominated by spikes, slow waves, and spike-waves.

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