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Epidemiology and diagnostic and therapeutic management of febrile seizures in the Italian pediatric emergency departments: A prospective observational study

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ABSTRACT

Aim: Febrile seizures (FS) involve 2–5% of the paediatric population, among which Complex FS (CFS) account for one third of accesses for FS in Emergency Departments (EDs).

The aim of our study was to define the epidemiology, the clinical, diagnostic and therapeutic approach to FS and CFSs in the Italian EDs.

Methods: A multicenter prospective observational study was performed between April 2014 and March 2015.

Patients between 1 and 60 months of age, randomly accessing to ED for ongoing FS or reported FS at home were included. Demographic features and diagnostic-therapeutic follow-up were recorded. FS were categorized in simple (<10 min), prolonged (10–30 min) and status epilepticus (>30 min).

Results: The study population consisted of 268 children. Most of the children experienced simple FS (71.65%). Among the 68 (25.37%) patients with complex FS, 11 were 6–12 month-old, accounting for 45.83% of all the infants with FS in the younger age group.

No therapy has been administered at home in 76.12% patients; 23.51% of them received endorectal diazepam and only 1 patient received buccal midazolam.

At arrival at ED, no therapy was necessary for 70.52% patients; 50.63% received endorectal diazepam and 17.72% an i.v. bolus of midazolam.

Blood tests and acid-base balanced were performed respectively in 82.09% of cases. An electroencephalogram at ED was performed in 21.64% of patients. Neuroimagings were done in 3.73% of cases. A neurologic consultation was asked for 36 patients (13.43%).

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Conclusion: this is the first study assessing epidemiologic characteristics of FS in the Italian pediatric population, evidencing a higher prevalence of CFSs in children younger than 12 months of age and opening a new research scenario on the blood brain barrier vulnerability. On a national level, our study showed the need for a diagnostic standardized work-up to improve the cost/benefit ratio on CFS management.

1. Introduction

Febrile seizures (FS) represent the most common presentation of infantile convulsions, involving 2–5% of the paediatric population and usually occurring within the first 6 months–5 years of age, with a peak at 14–16 months of age (Wairuru and Appleton, 2004).

Complex febrile seizures (CFSs) are diagnosed when a febrile seizure lasts more than 10–15 min, or is repeated within the first 24 h from the onset, associated with post-ictal neurological signs (such as Todd's paresis), or with positive neurological anamnesis (The American Academy of Pediatrics, 2011; Società Italiana di Neurologia Pediatrica, 2016) and associated with neurological signs. When a single CFS or repetitive CFSs last more than 30 min, without recovery of the normal consciousness among convulsive events, a febrile status epilepticus occur (Knudsen, 2000).

Experimental studies, leaded in the 80s, showed that the Central Nervous System (CNS) homeostasis was constitutively altered in case of seizures lasting more than 30 min (Lothman, 1990). In regards, literature data suggest to shorten the time of seizure duration, in order to reduce CNS risk factors. On the other hand, further studies showed that a single epileptic event usually resolve within 2–5 min, while those critical events lasting more than 10–15 min show a higher risk not to be spontaneously resolved (Bassin et al., 2002; Shinnar et al., 2001; Lowenstein et al., 1999; Mastrangelo and Celato, 2012). Therefore, the importance for an adequate diagnosis and prompt treatment of CFSs, above all in the youngest.

Literature data have often reported the association between CFSs and different risk factors, such as clinical features of the child, genetic and metabolic factors, viral and/or bacterial infections and anatomic CNS abnormalities [10]. Febrile status epilepticus occurs almost in 10% of children affected by viral and/or bacterial infections, nevertheless in this case CFS rarely represents the only neurologic clinical sign (Kimia et al., 2010).

In case of CFSs, the Italian Guidelines suggest to perform a deep diagnostic flow-chart, both in the Acute and Emergency setting and during the hospitalization, to diagnose the etiology of fever (I grade of evidence) and any concomitant CNS disease (Commissione Triage Pediatrico SIMEUP, 2009).

Usually febrile convulsions lasting more than 15 min are pharmacologically treated and interrupted, even if they should be effectively considered as CFSs. As far as the pharmacological approach to CFSs in the Acute and Emergency Unit is concerned, Benzodiazepines (BDZs) are considered the first therapeutic line (McIntyre et al., 2005), even if more than two doses are not recommended, due to the risk of respiratory distress, while phenytoin and phenobarbital have been considered as a second treatment choice (Mastrangelo and Celato, 2012).

Herein the authors present a multicenter prospective observational study, involving the major Hospitals of the North, Central and South Italy, with the aim to define the epidemiology of FS and CFSs in the Italian paediatric population and to describe the clinical, diagnostic and therapeutic approach to CFSs in the Italian Acute and Emergency Departments.

2. Materials and methods

A multicenter prospective observational study was performed between April 2014 and March 2015. All the Pediatric Emergency Departments (EDs) adhering to the Italian Society for Pediatric Emergency and Urgency (SIMEUP) were asked to participate to the study. Ten centers throughout Italy (Catania, Castelvetrano, Modena, Palermo, Perugia, Pietra Ligure, Rome, Seriate (BG), Turin Regina Margherita Children's Hospital and Turin—Maria Vittoria Hospital) adhered to the study. The prevalence of febrile seizures (FS) was calculated on the population of the included centers that provided the data about all the children with FS conducted consecutively to their EDs during the study period.

Patients between 1 and 60 months of age, randomly accessing to ED between April 2014 to March 2015 because of ongoing FS or reported FS at home were included in our study. Febrile seizures were defined as provoked seizures where the sole acute provocation was fever (temperature >38.4° C) in children ageing 6–60 months (Bassan et al., 2013). Complex FS were defined as seizures lasting >10 min (Hesdorrfer et al., 2011) and/or focal and/or repetitive within 24 h and/or with postictal neurological abnormalities.

The exclusion criteria were as follows: personal history of afebrile seizures, patients on therapy with antiepileptic medications, personal history of cerebral disorders (brain malformations, cerebral palsy, stroke, intracranial tumors, Central Nervous System infections) or concomitant head injuries.

For each included patient, the following data were collected at ED: age at admission; sex; personal history of FS; familiar history of epilepsy, neurological disorders and FS; pre-hospital management information, including any medication administered at home or on the way to the hospital both by caregivers and paramedic personnel; in-hospital ED information, including time of arrival, physical examination at the arrival (including body temperature, SatO2, heart and respiratory rate), duration (defined as the interval between the reported onset and the cessation of clinical seizure activity) and clinical characteristics of seizures (including spontaneous recovery or recovery under medication), kind of medication used, need of intravenous line or ventilation, any test performed in the ED (blood and urine tests, rachicentesis, EEG, ECG, cerebral CT and MRI, neurological and anesthesiological consults).

According to the collected data, FS were then categorized in simple (<10 min), prolonged (10–30 min) and status epilepticus (>30 min) and the diagnostic and therapeutic follow-up was stratified and analysed accordingly.

In each center, copies of the ambulance transport service notes and the EDs medical datasheets were collected and all the records from such resources were put in one single central database, according to the patients' privacy policies.

The study was performed according to the international regulatory guidelines and current codes of Good Epidemiological Practice. Considering that patient care was not altered by inclusion in the study, the approval of ethical committee was not necessary.