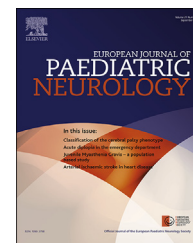




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Original article

Acute diplopia in the pediatric Emergency Department. A cohort multicenter Italian study



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ABSTRACT

Background: Acute diplopia (AD) is an uncommon and distressing symptom of numerous ocular and neurological conditions, with potentially serious sequelae. No data are present in pediatrics on the presentation and management of AD.

Aim: This study investigated characteristics, etiology and health care utilization of the pediatric population with AD accessed to pediatric Emergency Departments (ED), trying to identify "red flags" associated with potentially life-threatening (LT) conditions.

Methods: We conducted a cohort multicenter study on children with AD in ten Italian hospitals. Patients were classified into diagnostic categories, comparing children with and without LT disease.

Abbreviations: ED, Emergency Department; LT, Life-threatening; no-LT, no-Life-Threatening; CT, Computed Tomography; MRI, Magnetic Resonance Imaging.

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Diplopia
 Double vision
 Neuroimaging
 Life threatening condition

Results: 621 children presented AD at a rate of 3.6 per 10,000. The most frequent diagnosis among no-LT conditions (81.2%) were headache, ocular disorders and minor post-traumatic disease, while LT conditions (18.8%) were represented by brain tumors, demyelinating conditions, idiopathic intracranial hypertension and major post-traumatic diseases. The LT group showed a significantly higher age, with the odds increased by 1% for each month of age. Monocular diplopia occurred in 16.1%, but unlike adult one-fifth presented LT conditions. Binocular diplopia, associated ocular manifestations or extraocular neurological signs were significantly more common in the LT group. At regression logistic analysis strabismus and ptosis were associated with LT conditions.

Conclusion: The majority of children presented no-LT conditions and more than one-fourth of patients had headache. Monocular diplopia in the LT group was never isolated but associated with other signs or symptoms. Our study was able to identify some specific ocular disturbances or neurologic signs potentially useful for ED physician to recognize patients with serious pathologies.

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1. Introduction

Diplopia is the subjective perception of two images of one object at different points in space. Patients may not realize that double vision is present, but may complain, especially in children, about blurred vision, ghost images, visual confusion, eye strain, or even dizziness.^{1–3} The evaluation of diplopia can be intimidating in pediatric patients, even for the most experienced neurologist or ophthalmologist, and the patient may not be able always to cooperate with the examination.⁴ Acute diplopia (AD) is an uncommon and distressing symptom, especially in pediatric age, of a wide variety of ocular and neurological diseases, including potentially life-threatening conditions (LT) (i.e. tumors or vascular or demyelinating disease) presenting to a pediatric Emergency Department (ED), or outpatient general hospital or general practitioners. For this reason, AD is challenging to manage and causes an increase in anxiety and level of concern amongst physicians and parents.⁵

Therefore, the emergency physician must be skilled to identify rapidly the minor percentage of patients with potentially LT forms requiring further diagnostic procedures such as neuroradiological investigations, which could be not useful and potentially dangerous in the developmental age.^{6–8} Despite the clinical importance of AD, previous studies considered diplopia in selected adult population in hospitalized patients or subjects evaluated in neurologic and ophthalmologic clinics.^{2,3,5,9,10} Surprisingly in the literature, there is only one study on adults conducted in ED, evaluating the characteristics, the frequency of different etiologies and management.² To our knowledge, no data are present in pediatric population on the presentation and management of AD, neither in ED nor in outpatient settings. Moreover, differential diagnosis is extensive and challenging even because of children's difficulties in describing experienced symptoms, and this may lead to excessive health care spending, and unnecessary testing even for non-urgent conditions.¹¹ Thus, this is the first study investigating a pediatric population with AD, to enucleate the role of specific features indicating

patients with potentially LT conditions. Our study analyzed 6 years of retrospective data from ED of ten Italian tertiary hospital, to assess the etiology and management of AD in pediatrics. Specifically, the study aimed to describe general characteristics, etiology and health care utilization in the pediatric population with AD, trying to identify a correct diagnostic approach, possible recognition of specific clinical pictures with correlated “red flags” potentially associated with LT conditions and to address future research.

2. Material and methods

After obtaining approval from the institutional ethics committees, we conducted a retrospective multicenter study of patients, aged between 4 and 17 years, presenting to the ED with a primary complaint of AD, between January 2009 and December 2014.

The Italian multicenter study on AD in children, conducted on behalf of Società Italiana di Neurologia Pediatrica (SINP), involved the ED of ten Italian pediatric hospitals spread throughout the country (Torino, Padova, Genova, Bologna, Firenze, Roma with 3 center, L'Aquila, Catania). All patients enrolled in the study presented “AD” in whom the diagnosis was made in ED, excluding the patients previously diagnosed.

The following data were extracted from each medical record: age, gender, triage code, time of onset divided in three categories according to the duration of signs/symptoms before admission, history, associated ocular and extra-ocular signs/symptoms (the neurological sign is an objective manifestation, visible or otherwise objectively measurable, while the neurological symptom is a subjective manifestation), physical examination findings, associated or comorbid pathologies, specialist consultations, imaging techniques such as computed tomography (CT) scan and magnetic resonance imaging (MRI), final diagnosis, hospital admission and length of stay, as applicable.

The following codes were used to describe patient conditions at the time of triage: red or immediate (need to be seen

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