International Journal of Contemporary Pediatrics
Fadnis M et al. Int J Contemp Pediatr. 2019 Nov;6(6):2622-2627
http://www.ijpediatrics.com
pISSN 2349-3283 | eISSN 2349-3291

DOI: http://dx.doi.org/10.18203/2349-3291.ijcp20194743

Original Research Article

Syncope in children clinicoetiological correlation

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Received: 21 August 2019
Revised: 09 September 2019
Accepted: 03 October 2019

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ABSTRACT

Background: Syncope is the abrupt cessation of cerebral blood flow leading to temporary loss of consciousness. Identification of etiology is utmost important as any syncopal event may be life threatening. Aim was to correlate the clinical and etiological causes of syncope in children and to note their investigational profile.
Methods: Among 40 patients presenting with syncope and presyncope were studied. History of the event, precipitating factors were noted. They were investigated with the help of blood pressure, Electrocardiogram (ECG), 2D Echocardiogram and Electroencephalogram (EEG).
Results: Out of the 40 patients of syncope 65% were above the age of 10 years with male preponderance (60%). Vasovagal syncope (57%) was the most common cause of syncope followed by orthostatic hypotension (15%), neurological (15%), and cardiac etiology (6%). In the neurological etiology the EEG showed diffuse slow background with occasional sharp bursts in right frontal area in 2 patients while in 4 patients sharp bursts were present in the centero-temporal region. 17% were classified as presyncope, 60% as mild and 22% as having severe syncope. There was a significant correlation of etiology of syncope with duration of hospitalization of more than 4 days and with recurrence of syncope. There was significant correlation of Evaluation of Guidelines in Syncope (EGSYS) score >3 with cardiogenic syncope. On follow up, neurological syncope patients had significant decrease in the number of syncopal episodes as they were immediately started on antiepileptics.
Conclusions: Electrocardiogram, 2D Echocardiogram and Electroencephalogram are important tools for the early management and treatment of cardiac and neurological etiology of syncope.

Keywords: Electrocardiogram, Electroencephalogram, Etiology, Evaluation of guidelines in syncope, Presyncope, Vasovagal

INTRODUCTION

Syncope is defined as temporary loss of consciousness and postural tone resulting from an abrupt transient decrease in cerebral blood flow.[1]

Normal brain function requires adequate blood pressure, sufficient oxygen supply and energy substrate like glucose. Inadequacy of these factors due to hypotension, hypoxia or hypoglycemia can lead to syncope.[2] Both syncope and presyncope affect quality of life especially of those who have frequent episodes hence prompting their investigations into causes and prevention.[3] Although

syncope is often a benign condition, each patient should be assessed with a good detailed history and physical examination, further investigations should be performed in undiagnosed patients.[4,5] The abrupt brief loss of consciousness is usually dramatic and alarming to patients, family, onlookers, and providers.[6] The incidence

of syncope appears to peak around the age of 15 years, with 20% to 50% of females reporting to have experienced at least one syncopal episode by the age of 18 years.[7] Recurrent syncope accounts for 3%in emergency department and 1% of hospital admissions.[8] Whereas the vast majority of episodes of syncope are benign, a minority are caused by something potentially more serious or even life threatening. There are only a few Indian studies on syncope in children.[9] Hence this study has been attempted to identify the presentations and clinical and etiological correlation of syncope in children. Aim and objectives were to note the presentations of syncope and associated symptoms, to analyze the investigational profile of these children, to classify the severity of syncope, to correlate the clinical and etiological causes of syncope in children.

METHODS

It was a cohort study conducted at a tertiary referral pediatric center with multidisciplinary subspecialties. Study period was 5 years (4 years retrospective and 1 year Prospective). A total of 40 children with syncope have been studied. This was based on the observation that on an average 8-10 patients are evaluated every year for syncope, of which 3-4 are lost to follow up. Children with even a single episode of syncope/ Presyncope were eligible for the study. with age more than 1 year of age and less than 18 years.

Exclusion criteria

- Cases lost to follow up
- Children on medications that can cause syncope
- The clinical records of pediatric patients presenting with a primary complaint of syncope/presyncope were reviewed.

Informed consent of the patients was taken. Permission from the institutional ethics committee was taken. Those patients who were diagnosed with syncope in the past 4 years were studied from records available from the cardiology and neurology divisions of the department, the history, examination findings , investigations done were recorded in the study proforma and treatment offered and follow up record for at least 6 months assessed and documented. Children presenting with momentary loss of consciousness (syncope) were evaluated with a Detailed history and the necessary investigations in the form of blood pressure measurement, electrocardiography (ECG) and electroencephalography (EEG). The patients did not bear any additional cost for the study purpose.

Statistical analysis

Data was analyzed using SPSS Software version 15 and Sigma plot version 12. Appropriate statistical tests like unpaired and paired t-test for quantitative data and chi square test for qualitative data were applied. p-value of less than 0.05 was considered statistically significant.

RESULTS

A total of 40 patients presenting with syncope were analyzed.

There were 24 males and 16 female patients with 65%of the patients (26) above the age of 10 years. The most common etiology of syncope was vasovagal followed by neurological cause, orthostatic hypotension and cardiac syncope.

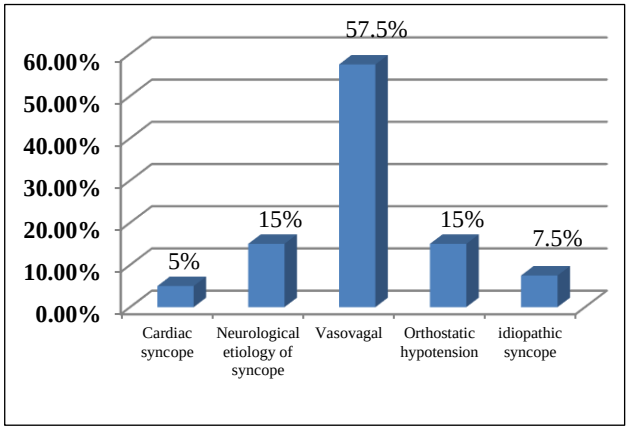

Figure 1: Etiology of syncope.

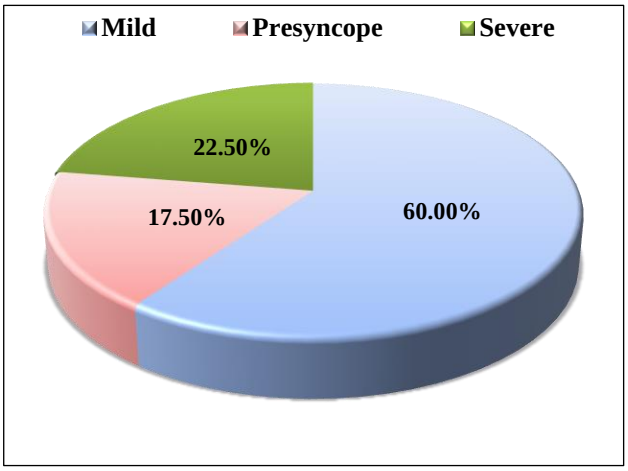

Figure 2: Severity of syncope.

Table 1: Activity triggering syncope.

Activity triggering syncope	No of patients	Percent
While taking a bath	4	10
After heavy play	7	17.5
After sudden change in posture	6	15
Exam stress (psychological stress)	2	5.0
Exercise	1	2.5
Standing for a long time	8	20
Walking	1	2.5
No	11	27.5

Both the patients of cardiogenic syncope had EGSYS score >3 and this correlation was statistically significant (p<0.001).

Table 2: Etiology of syncope and associated features.

Correlation parameters	Etiology (cardiac, neurological, vasovagal, orthostatic hypotension, idiopathic) p-values
Age (>10 years)	0.86
Gender	0.62
Duration of hospitalization (>4 days)	0.016
Severity (mild, moderate, severe)	0.11
Recurrence	0.027
Family history of syncope	0.67

Table 3: Severity of syncope and associated features.

Parameters	Severity (presyncope, mild, severe syncope) p-values
Age	0.775
Gender	0.78
Duration of hospitalization (>4 days)	0.54
Recurrence	2.75
Family history of syncope	0.54

There was significant decrease in the number of episodes after following up of 6 months after diagnosis and initiating appropriate treatment. (p<0.0001 using paired t-test)

DISCUSSION

Syncope is not a disease but a symptom of various disease processes.[10] Approximately 4% of patients discharged from the emergency department with syncope return within 72 hours and are admitted.[11] In the study various causes of syncope have been studied as well as their relation to various parameters analyzed and distribution in various age groups assessed. In the present study, 14 out of 40 children were below the age of 10 years (%) and remaining 26 children were 10 and above 10 years (%) with mean age 9.7 In a study conducted by Nesrin C et al, age group of 1-18 years was included in the study group with mean age being (11.5±4.6).[4]

A study done by Chen Li,154 children were included and their age ranged from 5 years to 18 years, and mean age was 12.0±3.0 years.[12] These findings are similar to the one found in the present study. Comparing the literature with the present study reveals that syncope mostly occurs in the adolescent and preadolescent age group although there is wide distribution of the cases. No significant correlation between age and etiology of syncope was noted due to wide distribution of cases in both the age groups. 24 of 40 children studied were males and remaining 16 were females. This is in contrast to studies done by Nesrin et al, Chen et al, and Ilario et al, which mention females to be more likely to have syncope as compared to males.[4,12,13]

As this being a multidisciplinary hospital with cardiology and neurology subspecialties evaluation of syncope in the etiological diagnosis of syncope was prompt. Various investigations in the form of supine sitting standing blood pressure, ECG, 2D ECHO and EEG were used for the detection of precise etiology of syncope. In the present study diagnosis of syncope was established in 37 patients (92.5%). Vasovagal syncope was the commonest cause of syncope (57.5%) followed by neurological cause (15%), orthostatic hypotension (15%), cardiac etiology of (5%) and idiopathic (7.5%) (Figure 1).

Vasovagal syncope (neutrally mediated syncope). It typically involves a precipitating event and a prodrome. The mechanism for the common faint involves an exaggerated reflex response in vasomotor tone and heart rate. In the present study number of cases with vasovagal syncope was 57%. In the patients with vasovagal syncope, 7 had symptoms after heavy play; 2 after psychological stress;1 after exercise, 8 after prolonged standing, one while walking and 4 while taking a bath (Table 1). In a study carried out by David et al, syncope was seen in 1 patient after coughing in shower, after noxious stimulus and 1 during exercise.[1,14,13] Patients with cardiac syncope had symptoms in the form of palpitation and chest pain. In the patient with complete heart block syncopal event was triggered after exercise There are many studies showing vasovagal syncope as the commonest cause of syncope, consistent with the present study that is Courtheix et al, Schuster et al, Day et al.[5,15,16] These findings suggest that every patient who has even one syncopal attack should be promptly investigated since the underlying cause could be a benign one like a vasovagal syncope where symptomatic treatment can bring about sufficient improvement in symptoms.

Cardiac etiology of syncope-severe heart defects, conduction abnormalities, ventricular arrhythmias or aneurysmby causing a decrease in the cardiac output with resulting cerebral hypoperfusion and syncope. In a study done by Paolo et al, there was increased risk of sudden cardiac death in patients with hypertrophic cardiomyopathy who presented with syncope.[17] In another study done by Massin et al, cardiac syncope was seen in 2% of the total cases which included supraventricular tachycardia and myocarditis.[18] Other studies like Aryik and Kilic also mention arrhythmias to be an important cause of syncope.[19,20] In these situations a simple investigation like a ECG can be of immense value as it can identify a potentially life threatening cause ,and immediate treatment can be lifesaving to the patient. In the present study, cardiac syncope was seen in two

patients; one had prolonged QT syndrome (QTc of 0.50) and second had a complete heart block.

Neurological etiology of syncope- In some individuals, global cerebral hypoxia results not only in loss of consciousness but in convulsive activity as well. In the present study the total patients with neurological syncope showing EEG abnormalities were 15% (6 patients). The EEG showed diffuse slow background with occasional sharp bursts in right frontal area in 2 of the patients while in other patients sharp bursts were present in the centro-temporal region. These findings are similar to the ones carried out by Dantas et al, Liu et al, and Sarasarin et al, who showed EEG abnormalities were present in 11-14% of the patients with syncope.[21-23] Thus EEG can be an important tool in the identification of neurological causes of syncope and also for the detection of seizure disorders which can otherwise be missed as a benign syncopal episode.

Orthostatic hypotension-occurs when there is a sudden reduction in blood pressure greater than 20/10 mm Hg as a result of postural change such as moving quickly from sitting to standing. It is therefore important to take supine as well as standing blood pressure as change in the posture can cause syncopal episode. The other important finding in the present study was that majority of patients having orthostatic hypotension were in the below 10 years age group. The incidence of orthostatic hypotension in lower age group can be because of autonomic immaturity as compared to that of older patients which is because of autonomic dysfunction/ instability. The incidence of orthostatic hypotension in the present study was 7.5%. In a study carried out by Atkins et al, incidence of orthostatic hypotension was 31%.[24] The HUTT test was done in 2 of the patients who had no cause of syncope. They had normal hutt result. Thus, there is limitation to the use of hutt. According to the survey done by Anjan et al, HUTT has limited utility in the detection of etiology of syncope.[25]

In the study 23 children required hospitalization with mean duration of hospital stay of 4.9 days. Of them both the patients having cardiac etiology of syncope (one had complete heart block and second prolonged QT interval) required hospitalization of more than 5 days and 4 patients with neurological cause and 2 with vasovagal syncope required hospitalization of more than 5 days for complete stabilization. This association between duration of hospitalization and etiology of syncope was statistically significant (Table 2). This state the importance of prompt identification of cases with cardiac etiology of syncope as they are an important cause of morbidity and prolonged hospitalization. It is of importance to follow up those having unidentified causes of syncope as they are prone to have repeat episodes in the study the patients after initial evaluation of syncope were followed up for a period of 6 months to see for repeat symptoms. Of them recurrence of syncope was seen in 10 patients. Of them repeat symptoms were seen in both the patients of cardiac etiology of syncope and 3 of patients of neurological cause of 2 of vasovagal syncope and 2 of orthostatic hypotension had repeat symptoms. This association of etiology of syncope and recurrence of syncope was statistically significant (Table 2). From this we can infer that it is important to follow up patients with diagnosed as well as unexplained syncope in order to bring about a change in treatment or to find out any other underlying factors. It is important to classify types of syncope according to severity as it helps in prognosticating the disease as well as requirement of hospitalization and reducing parent anxiety. In the present study Syncope was graded into Presyncope, Mild and Severe syncope.

- Presyncope- the occurrence of warning symptoms without loss of consciousness.
- Mild syncope- rapid recovery within seconds and.
- Severe syncope- prolonged postictal cerebral impairment that lasts mins or hrs.[3]

60% of patients had mild syncope, followed by 22% severe syncope and 17% presyncope (Figure 2). Majority of patients had mild syncope stating that majority of patients were diagnosed with syncope at the appropriate time and immediate action started. However, we could not find studies dividing syncope into mild and severe syncope. There was no significant correlation of severity of syncope with age gender duration of hospitalization, recurrence of syncopal attacks and family history of syncope (Table 3). Study done by American academy of neurology mentions more occurrence of syncope in identical twins as compared to dizygotic twins suggesting a possible positive family history.[26]

Of the 40 patients analyzed, 2(5%) patients had family history of syncope. One had family history of vasovagal syncope and other had neurological cause of syncope. study done by Newton et al, mentions positive family history for Vasovagal syncope.[27] There was no significant correlation between family history of syncope and severity and etiology of syncope (table3).

Of the total patients 30 came to the emergency department with syncopal event. EGSYS (Evaluation of Guidelines in Syncope) scoring system is a simple diagnostic score for identifying patients with cardiac syncope.

EGSYS Score

Palpitations preceding syncope - 4 points

- Heart disease and/or abnormal electrocardiogram (sinus bradycardia, second- or third-degree atrioventricular block, bundle branch block, acute or old myocardial infarction, supraventricular or ventricular tachycardia, left or right ventricular hypertrophy, ventricular preexcitation, long QT, Brugada pattern) - 3 points
- Syncope during effort - 3 points
- Syncope while supine - 2 points

- Precipitating or predisposing factors (warm, crowded place, prolonged orthostasis, pain, emo-tion, fear) - minus 1 point
- A prodrome of nausea or vomiting - minus 1 point

In the present study, of the 40 patients studied 2 patients had EGSYS score≥3 and both of them had cardiac etiology of syncope (p<0.001). Thus, EGSYS can be an important score in the prediction of cardiac etiology of syncope in the emergency department and also help in the early diagnosis of cardiac syncope. In a cohort study done by Del Rosso et al, respectively with a score of >=3 to be associated with cardiac etiology of syncope.[28] Other study done by Plasek et al, states that EGSYS score >3 helps in prediction of cardiac etiology of cause of syncope.[29] There have not been many studies implementing this score in the emergency department for the identification of cardiac syncope. Comparing the correlation between severity and recurrence of syncope, 4 of patients with mild syncope had follow up repeat symptoms whereas 2 of pts with presyncope and 4 pts with severe syncope had follow up repeat symptoms. Thus, even presyncope patients can have recurrence of syncope after diagnosis and even they should be regularly followed up.

Another interesting finding was that number of episodes after following up of 6 months had significantly decreased as compared to earlier number of episodes. This can be because of prompt identification of etiology and institution of appropriate treatment which led to decrease in the number of syncopal episodes. Vasovagal syncope patients received conservative treatment in the form of behavior modification, advice to avoid dehydration, long periods of standing and irregular mealtimes, parent and child education.

Patients with neurological etiology of syncope (with abnormal EEG) received antiepileptics; those with cardiac etiology of syncope (one with complete heart block; second with prolonged QT interval) were followed up started on-medications. Thus, prompt evaluation of syncope is important as it helps to identify the cause as well as start the necessary treatment to reduce the future occurrence of syncope.

CONCLUSION

Vasovagal syncope was the most common cause of syncope. Electrocardiogram, 2D Echocardiogram and Electroencephalogram are essential for the early management and treatment of cardiac and neurological etiology of syncope. EGSYS score is helpful in the risk stratification as well as helpful in the detection of cardiac syncope. There was significant correlation of orthostatic hypotension, cardiac and neurological etiology of syncope with recurrence of syncope and duration of hospitalization. Follow up and counselling of patients with syncope is essential as even benign syncopal episodes incite anxiety in caretakers.

Funding: No funding sources
Conflict of interest: None declared
Ethical approval: The study was approved by the Institutional Ethics Committee

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Cite this article as: Fadnis M, Prabhu S, Venkatesh S, Kulkarni S. Syncope in children clinicoetiological correlation. Int J Contemp Pediatr 2019;6:2622-7.