

Research Article

Syncope in Children: A Review on Etiology, Evaluation and Management Strategies Indicated

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Abstract

Syncope is a common problem presenting in paediatric emergency department. It is a transient loss of consciousness followed by spontaneous complete recovery. It is a frightening scenario which can present at anytime in paediatric emergency. Neurally mediated syncope (NMS) is the commonest cause of syncopal attack in children and adolescents. It is benign. It should be differentiated from Cardiac syncope. Cardiac syncope is serious and need specific management of cardiac problem History taking is crucial for diagnosis. it is very important to identify red flags to differentiate benign neurally mediated syncope from severe cardiac syncope. Objective of this study is to review etiology of syncopal attacks in children, to find out different methods of evaluation and to enlist in short management strategies indicated. Authors have reviewed many recent articles on evaluation and management of paediatric syncope. It was concluded that NMS (neurally mediated syncope) is the commonest and benign cause of syncopal attack in children and adolescence. Reassurance is key to the management Some times if history is suggestive of any psychiatric pathology, early referral of patients to mental health specialist is also indicated Neurally mediated syncope can be managed with life style measures. Encourage proper diet, exercise, drinking plenty of water, adequate salt intake is also recommended.

Keywords

Syncope, Neurally Mediated Syncope (NMS), Transient Loss of Consciousness, Life Style Measures

1. Introduction

Syncope is a transient loss of consciousness (TLOC) and inability to maintain posture caused by transient global cerebral hypo-perfusion [1].

Term syncope is derived from greek word Synkoptein which means to abbreviate, interrupt or shorten). According to The Open Cardiovascular Medicine journal, in June 2022 syncope presents a proportion of upto 25% in children and adolescents. It accounts for 0.9% of emergency room visits [2] Pathogenesis, etiology, diagnosis and treatment of paediatric syncope differ from those in adults. Recurrent syncope can

seriously impact physical and mental health, learning abilities, and quality of life in affected children.

2. Etiology

Vast majority (70-80%), of paediatric loss of consciousness event is caused by neurally mediated hypotension leading to neurally mediated syncope (NMS). [3] NMS is also called reflex syncope (vasovagal syncope) and may include

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orthostatic hypotension (OH).

Recent systematic study of children aged between 3 to 21 years with syncope showed that neurally mediated etiology is most common (52.2%) Followed by postural orthostatic

tachycardia syndrome (POTS) (13.1%). Cardiac cause was responsible for 4% of cases of syncope and in 18.3% cause was not identified [4].

3. Classification of Transient Loss of Consciousness

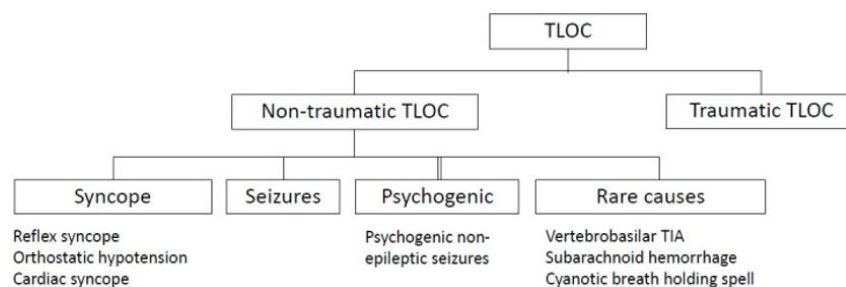


Figure 1. TLOC. classification.

4. Causes of Syncope

4.1. Neurally Mediated Syncope (NMS)

Neurally mediated syncope (NMS) also known as vasovagal syncope or simple faint is the most common cause of loss of consciousness in childhood. It is characterised by syncopal attacks caused by abnormal reflex regulation or dysfunction of autonomic nervous system, mainly referring to vasovagal syncope (VVS) or Postural orthostatic tachycardia syndrome. (POTS) [5] 30-40% children and adolescents with VVS/POTS also have allergic disease, and other comorbidities including migraine, mental disorder, sleeping disorder, hyperventilation syndrome, chronic fatigue syndrome, joint hyper mobility syndrome, gastrointestinal disorders etc. Comorbidities may increase complexity of diagnosis and treatment.

Cardiac syncope mainly caused by abnormal structure or rhythm of heart. It is a rare cause of paediatric syncope. It is associated with high risk of sudden death.

In non cardiac cause, conversion disorder needs special mention. patients often have numerous events during the day and events may last many minutes to hours. During the event blood pressure and heart rate will be normal for age. Events are not triggered by positional change, heat, prolonged standing and do not cause injury. In a patient with unusual loss of consciousness occurring multiple times per day, occurring in sitting or supine position or with events that last longer than 3 to 4 minutes consider conversion disorder.

Pathophysiology of NMS

Human body has a remarkable ability to maintain stable blood pressure. To maintain this steady control reflex mechanisms continuously adjust the cardiac output and

vascular tone. Orthostatic stress is one of the most commonly encountered triggering factor seen in clinical practice. [6].

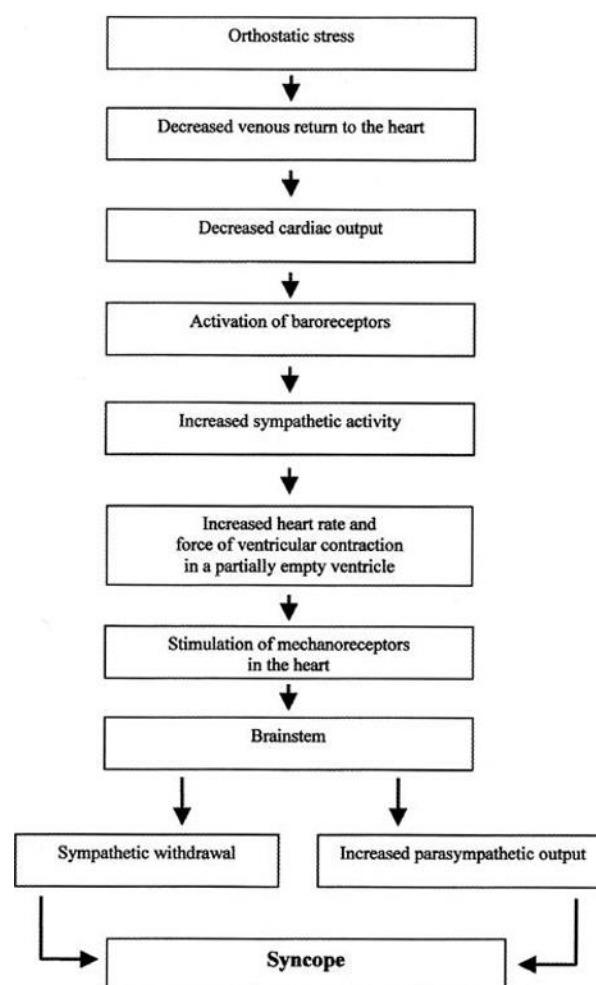


Figure 2. NMS Pathophysiology.

4.2. Cardiac Causes of Syncope

- 1) Left Ventricular Outflow Obstruction
- 2) Right Ventricular Outflow Obstruction
- 3) Ventricular Tachycardia
- 4) Congenital Long QT syndrome
- 5) Bradyarrhythmias
- 6) Sick Sinus Syndrome
- 7) Heart Block

4.3. Non Cardiac Causes of Syncope

1. Basilar Migraine
2. Seizures
3. Vertigo
4. Hyperventilation
5. Situational Syncope (Induced by Cough, micturition, Stretch, Hair Grooming, Defecation)
6. Breath Holding Spells
7. Psychological Problems and Psychiatric Disorders
8. Malingering
9. Munchausen Syndrome
10. Conversion Disorder
11. Anxiety
12. Depression
13. Panic Attack

5. Evaluation and Treatment of Syncope

Initial evaluation of a patient with syncope consists of taking a careful history, and a physical examination including orthostatic blood pressure measurements and standard electrocardiogram [7].

Comprehensive history taking including present and past attacks, as well as eyewitness accounts in person or through a telephone interview or video recording of the episode is very important. Clinicians need to understand the clinical features of diseases that require differentiation from syncope such as seizures.[8].

5.1. Factors That Suggest Cardiac Syncope

1. Little/no prodrome
2. Prolonged loss of consciousness (more than 5 minutes)
3. Exercise induced syncope
4. Chest pain /palpitation
5. History of cardiac disease
6. Family history of longQT syndrome
7. Cardiomyopathy or sudden death

5.2. Factors That Suggest NMS

Table 1. Evaluation of syncope.

	NMS	Cardiac	Neurological	Psychogenic
Syncope history	Syncope with position changes, prolonged standing, heat; presyncope (light-headed, dizzy, nausea, warmth, pallor, diaphoresis, visual and hearing changes)•Proceeded by growth spurts, menses, rapid weight loss	Syncope during exercise•Palpitations, chest pain before or during syncope	Lack of prodromal symptoms•Rapid, forceful loss of tone•Headache before syncope•Sudden, severe tiredness before syncope•Large-amplitude, single/clustered, arrhythmic jerks of one or more extremities•Behavioral slowing/arrest followed by loss of muscle tone•Prolonged post-ictal period•Inability to describe anything during the ictal phase•Incontinence or lateral tongue biting with prolonged low-frequency, high-amplitude, rhythmic bilateral jerking•Definitive head/eye deviation before collapse•Focal neurological signs after syncope	Prolonged syncope (minutes to hours)•Often unwitnessed syncope•Strong history of physical complaints over several years•Hyperventilation before syncope•Syncope while supine with no concerning neurological associations
Family history	Similar NMS	Cardiomyopathy•Pacemaker/ICD•Channelopathy: e. g., long QT, Brugada syndrome•Sudden unexplained death	Seizures•Migraines•Neurocutaneous disorders•Sleep disorders•Vestibular disorders	Anxiety/depression
Vital signs	Positive	Can be altered	Normal	Normal

	NMS	Cardiac	Neurological	Psychogenic
	orthostatic vital signs			
Examination	•Normal	Cardiac murmurs•Evidence of heart failure on examination	Focal neurological abnormality•May be normal	Normal
Electrocardiography	•Normal	Ventricular hypertrophy•Ventricular pre-excitation•Long QT interval•Abnormal t-waves•Heart block•May be normal	Normal	Normal

- 1) Prodrome
- 2) Associated symptoms
- 3) Triggering events like exercise
- 4) More serious cardiac syncope should be eliminated in exercise related syncope

6. Clinical Findings in Differential Diagnosis of Syncope

Key elements in history taking [9].

- 1) Time of the event
 - 2) Activity leading to the event
- Associated symptoms
- 3) Posture at the time of event
- Family history

7. Investigations

7.1. Routine EKG Electrocardiography

A 12 lead EKG is recommended for all paediatric patients who present with syncopal episode. History of exercise induced syncope, positive family history, abnormal physical examination, or abnormal EKG had 96% sensitivity in identifying cardiac etiology of syncope [10].

7.2. Laboratory Studies

Routine blood tests are not indicated [10].

7.3. Orthostatic Vital Signs

Blood Pressure in Sitting and Standing Position.

7.4. Echocardiography

Routine echo cardiogram is not recommended in syncope management in healthy paediatric patients. Only indicated when there is concern for structural heart disease [10].

7.5. Ambulatory Electrocardiography (AEKG)

Role is limited in the absence of structural or functional heart disease. However AHA /ACC guidelines do provide a strong recommendation in obtaining AEKG in pediatric patients with exertion syncope when the cause is otherwise unknown [10].

7.6. Neuroimaging

Per AHA/ACC practice guidelines, routine neuroimaging is not recommended except in cases with focal neurodeficits. [10].

7.7. EEG (Electroencephalography)

EEG is not indicated in the evaluation of patients with syncope unless there is concern for seizures. Patients who exhibit prolonged loss of consciousness, seizure like activity and post ictal confusion should have further evaluation with EEG [10].

In most cases, no further diagnostic tests are needed when the history, physical examination and ECG suggest NMS [11].

7.8. Diagnostic Procedures for Paediatric Syncope

7.8.1. Orthostatic Challenge

Changing from supine to upright position produces a displacement of blood from thorax to the lower limbs and abdominal cavity that leads to a decrease in venous return and cardiac output.[12].

7.8.2. Active Standing Test

Active standing test can be performed to screen for underlying cause of orthostatic tolerance in children. It has no absolute contra indications. First children are asked to lay supine for 10-30 minutes to obtain supine heart rate, Blood Pressure and, ECG. Then children are told to actively stand for another 10 minutes. Simultaneously record all parameters again. Abnormal Blood Pressure fall is defined as a

progressive and sustained fall in systolic Blood. Pressure from baseline value more than 20 mm hg or diastolic Blood pressure more than 10 mm hg. Along with this a rise in heart rate more than 30 beats/ minutes while standing is consistent with neurally mediated hypotension that may result in NMS [10].

Comments on active standing tests.

During active standing tests, children should be closely observed to determine whether they have pre syncope symptoms (dizziness, headache, chest tightness, palpitation etc) or even syncope.[12].

7.8.3. HUTT

Head Up Tilt test [HUTT] is recommended in recurrent unexplained syncope, recurrent prolonged dizziness etc.

Patient lies on a table that can be rotated from 0 to 90 degree from horizontal, and he or she is monitored with continuous ECG and serial non invasive blood pressures. After supine resting data is collected, table is rotated to a tilt angle ranging from 60 to 90 degree for 10 to 60 minutes. A positive test consists of reproduction of patients clinical symptoms accompanied by bradycardia, hypotension or both. [13].

8. Patient Management

Most common cause of syncope in children is NMS. [11] With a typical history for NMS free from red flags, normal cardiac and neurological examination and normal EKG, likelihood of underlying cardiac and neurological pathology is minimal. If history is consistent with underlying psychological pathology, early referral to mental health specialist is the key.

First line treatment in paediatric patients with NMS is reassurance, adequate fluid and salt intake and regular exercise. Patients should learn to recognise potential triggers and prodromal symptoms of syncope and promptly sit or lie supine for 10 minutes or until symptoms resolve [13].

Reassurance is paramount because patients and families are often concerned that a serious or underlying medical problem may have caused syncopal event.

In patients with recurrent NMS despite adequate hydration and salt intake, medications may be of benefit.

Beta blockers, fludrocortisone, and midodrine are commonly prescribed.

9. Prognosis

NMS is benign. Recurrent syncope can seriously impact physical, mental health, learning abilities, and quality of life in affected children. In rare case of syncope with cardiogenic etiology can cause death also.

10. Conclusion

Syncope is a common problem in paediatrics and adolescents. NMS is commonest cause of syncope in children. It is needed to differentiate it from cardiac causes and other miscellaneous causes. Reassurance is the key. Lifestyle measures must be employed in all patients with NMS.

Abbreviations

NMS	Neurally Mediated Syncope
TLOC	Transient Loss of Consciousness
OH	Orthostatic Hypotension
EKG	Electrocardiogram
POTS	Postural Orthostatic Tachycardia Syndrome
VVS	Vasovagal Syncope
AEKG	Ambulatory Electrocardiography
AHA/ACC	American Heart Association/American College of Cardiology
EEG	Electroencephalography
HUTT	Head Up Tilt Test

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Conflicts of Interest

The authors declare no conflicts of interest.

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