DOI: 10.70949/pramed202301435S



# SYNCOPA IN CHILDREN AND ADOLESCENTS OUR EXPERIENCE

**CORESPONDENT**

Ljiljana Šulović
E-mail: ljiljanasulovic64@gmail.com

## AUTHORS

Ljiljana Šulović 1, Filipović-Danić 1, Vladimir Šulović 2, Zorica Živković 1, Milica Popović 3
1Medicinski fakultet, Univerzitet u Prištini sa privremenim sedištem u Kosovskoj Mitrovici
2KBC Zemun, Beograd
3KBC Priština, Gračanica

## SUMMARY

**Introduction**: Syncope is a sudden, short-lived, transient loss of consciousness associated with the inability to maintain postural tone. The aim of this paper is: to determine the frequency of syncope in children and adolescents in our conditions, to analyze the characteristics of syncopal episodes and clinical presentation in order to identify the etiology of seizures, and to provide diagnostic protocols, i.e. guidelines for streamlining clinical trials.

**Methodology**: The diagnosis of the disease was made clinically on the basis of well-taken anamnestic data and a detailed description of the quality of the attack, physical examination and routine laboratory analyzes: (CBC, glycemia, standard ECG). Additional tests were selectively performed: Holter ECG, ergometry, Tilt table test, Echocardiogram, NMR, EEG.

**Results**: Out of the total number of examined children in the outpatient Children's Hospital, Department of Pediatric Cardiology, 139 patients (0.6%) reported due to short-term loss of consciousness. The largest number of children was between 15 and 18 years old. Ninety-two ( 66%) of those 139 were girls, and 47 (34%) were boys (p <0.05). Regarding the cause of syncope, it was found in 117 (84%) patients, and in 22 (16%) children the cause of syncope was unknown (p <0.05). Etiologically spreaking, syncope was divided into 3 groups: autonomic (vasovagal, situational, orthostatic, increased vagus tone in athletes) was the most common, in 88 patients (75%), cardiogenic in 5 (4%) and non-cardiogenic in 24 patients.(21%). There was also a recurrence of the attack. In two children, the syncopal attack was repeated 4 times.

**CONCLUSION**: Syncope most often occurs in teenagers and is mostly benign. To assess syncope, it is necessary to gather a detailed history of the attack, to conduct a detailed physical examination and routine laboratory analyzes: CBC, glycemia and standard ECG. Supplementary diagnostics should be performed exclusively in patients where there is a reasonable suspicion of heart disease or neurological diseases.

K**eywords:** Syncope; Children; Adolescents; diagnosis; management

## SRPSKI

# SINKOPA KOD DECE I ADOLESCENATA - NAŠA ISKUSTVA

Ljiljana Šulović 1, Snežana Filipović-Danić 1, Vladimir Šulović 2, Zorica Živković 1, Milica Popović 3
1 Medical Faculty, University od Pristina, Kosovska Mitrovica; 2 Clinical Center, Zemun, Beograd; 3 Clinical Center, Gračanica

## SAŽETAK

**Uvod**: Sinkopa predstavlja iznenadni, kratkotrajni, prolazni gubitak svesti udružen sa gubitkom tonusa.

**Cilj rada je**: da se utvrdi učestalost sinkope kod dece i adolescenata u našim uslovima, da se analiziraju karakteristike sinkopalnih epizoda i klinička prezentacija u cilju identifikacije etiologija napada i da se daju dijagnostički protokoli tj. smernice za racionalizaciju kliničkih ispitivanja.

**Metodologija rada**: Dijagnoza bolesti klinički je postavljana na osnovu dobro uzetih anamnestičkih podataka i detaljnog opisa kvaliteta napada, fizikalnog pregleda i rutinskih laboratorijskih analize: (KKS, glikemija, standardni EKG). Dopunska ispitivanja su selektivno rađena: Holter EKG/a, Test opterećenja ,Tilt table test, Echocardiogram, NMR, EEG.

**Rezultati rada**: Od ukulpnog broja pregledane dece u ambulani Pedijatrijske bolnice KBC Gračanica, 139 pacijenata (0,6%) se javilo zbog kratkotrajnog gubitka svesti. Najveći broj dece bio je u uzrastu od 15 do 18 iodine Od tog broja 92-je ili 66% su bile devojčice, a 47 ili 34% su bili dečaci (p< 0,05). Što se tiče uzroka kod 117 (84%) pacijenata nadjen je uzrok sinkope, kod 22(16%) deteta uzrok sinkope je bio nepoznat (p<0,05). Etiološki sinkope smo podelili u 3 grupe: autonomne (vasovagalne, situacione, ortostatske, pojačan tonus vagusa kod sportista) su bile najčešće, kod 88-oro pacijenata (75%) , kardiogene kod 5-toro (4%) i nekardiogene 24-tvoro dece (21%). Takođe je bilo recidiva napada. U dvoje dece sinkopalni napad se ponavljao 4 puta.

**ZAKLJUČAK**: Sankofa se najčešće javlja kod tinejdžera i najvećem broju je benigne prirode. Za procenu sinkope neophodna je deteljna anamneza napada, detaljan fizikalni pregled i rutinske laboratorijske analize: KKS, glikemija i standardni EKG. Dopunsku dijagnostiku raditi isključivo kod pacijenata gde postoji osnovana sumnja na bolesti srca ili neurološka oboljenja.
**Ključne reči**: sinkopa, deca, adolescenti, dijagnoza, tretman

## INTRODUCTION

Syncope is a “transient loss of consciousness (LOC) due to transient global cerebral hypoperfusion characterized by rapid onset, short duration, and spontaneous complete recovery.” (1). Transient loss of consciousness (TLOC) in syncope is a consequence of hypoxia caused by the interruption or reduction of cerebral perfusion induced by acute hypotension or low oxygen levels in blood (anemia, pulmonary diseases, cardiovascular disease and/or defect) or a combination of both disorders (2,3). Time period of the complete loss of consciousness in a typical syncope is very short, more than 8 seconds and less than a minute (3). Recovery from syncope is characterized by immediate restoration in orientation, normal behavior and mental abilities.

Approximately 15% of children and adolescents between the ages of 8-18 have experienced at least one syncopal episode (4,5). Most syncopes have a benign course, (neurocardiogenic syncope), but it is estimated that approximately 1% to 2% of children suffering syncope have a serious cardiac or neurological disorder that can be life-threatening (6,7).

Distinguishing the cause of life-threatening syncope from benign neurally mediated syncope (NMS) is a key to streamlining testing in diagnosing and resolving problem (8, 9, 10, 11).

Regardless of the benign nature of neurocardiogenic syncope, several studies confirm that syncope has a considerable impact on quality of life, similar to other chronic diseases (diabetes, asthma, chronic kidney failure (12).

The purpose of this paper is:

1) to determine the incidence of syncope in children and adolescents in our conditions.

2) to analyze the characteristics of these episodes and the clinical presentation in order to connect with the etiology of syncopal event/ attack.

3) to identify a diagnostic course ie. guidelines for streamlining clinical trials.

METHOD: The paper prospectively included infants and children aged 6 months to 18 years, who were examined and treated in the Children’s Hospital, Department of Pediatric Cardiology for a period of four years (from the beginning of 2019 to the end of 2023) due to short-lived loss of consciousness.

Cases of syncope after head trauma or in patients with a previous diagnosis of epilepsy were not included in our study.

Clinical diagnosis was made based on well-taken anamnestic data and a detailed description of the intensity attack, a thorough conducting physical exam and routine laboratory analysis: (complete blood count, glucose, the standard electrocardiogram).

Additional tests were selectively performed: Holter ECG /Cardiac stress test, Tilt table test, Echocardiogram, Nuclear magnetic resonance (NMR), electroencephalography (EEG).

Study results: During the four-year period, 24,518 children were examined in the the Paediatric Outpatients Department. During this period, 139 children or 0.6% showed symptoms of short-lived loss of consciousness (Chart 1). Patients were aged from 8 months to 18 years. The greatest number of children was aged 15 to 18 years p <0.05. mean age 12.2 years (Chart 2).

Figure 1. The number of children suffering syncope

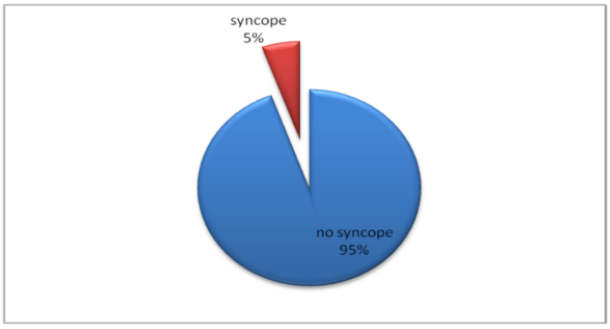



Figure 2. Distribution of syncope according to age

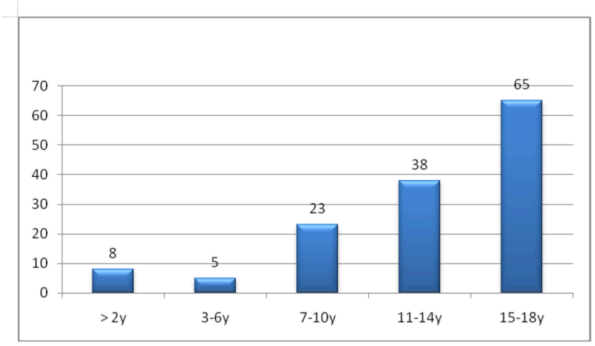
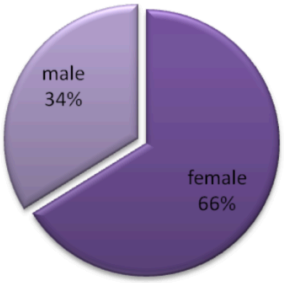



Figure 3. shows distribution of syncope according to gender. Out of the total number, 92 (66%) were females, and 46 or 34% were males (p <0.05).

Figure 3. Distribution of syncope according to gender




We were able to make etiological diagnosis of syncope in 117 (84%) cases, while in 22 (16%) patients the cause remained unknown. Figure 4 and Table 1 show the causes of syncope. Most children had an autonomic cause of syncope (i.e. vasovagal, situational, orthostatic, increased vagal tone in athletes) 88 (75%), non-cardiac causes were in 22 (21%). Cardiogenic syncope was present in 5 (4%) children.

Figure 4. Causes of syncopal seizures.

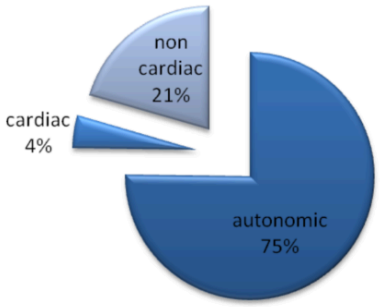



Figure 2. Distribution of syncope according to age

| | CAUSES OF SYNCOPE | N |
|---|---|---|
| AUTONOMIC (neurocardiogenic) | Vasovagal, | 36 |
| | Situational, | 18 |
| | Orthostatic, | 15 |
| | Vagal dominance in athletes | 19 |
| CARDIOGENIC | Dilated cardiomyopathy | 2 |
| | Arrhythmia | 2 |
| | Myocarditis | 2 |
| NON- CARDIOGENIC | Neurological | 6 |
| | Psychogenic | 12 |
| | Infection | 1 |
| | Metabolic disorders | 3 |

## DISCUSSION

Assessing and monitoring syncope episodes in the pediatric patients remains a challenge for physicians, as the guidelines focus mainly on adults. A small number of papers has dealt with syncope in children (2,3,4,5,9) despite the fact that syncope is common in children. Some authors are of the opinion that even 15% of children can experience at least one episode before 18 years. Moreover, 5% of young children go through similar episodes, called affective respiratory crises (4,5,6,9). The incidence of syncope in our study was 0.6% of children in a four-year period. Nevertheless we believe thatthe actual incidence of syncope in childhood may behigher, considering that some patients with syncopedo not come to medical attention.

Driscoll et al. (13), collected cases of syncope in two 4 year periods of time (1950-1954 and 1987-1991) and found that the incidence of syncope was 71.9/100.000 per year relatively to the first period of time and 125.8/100.000 per year in the second period.
Analyzing the age of children when syncope most often occurs, Gordon et al. (14 ) analyzed 73 subjects with syncope from 1981 to 1986 with a mean age of 13 years (range from 2 to 20 years old). Pratt and Fleisher (3) evaluated 77 subjects and adolescents who presented with syncope. These subjects were 22 months to 21.7 years old, with a mean age of 12.7 years. Another study done by Fadnis et al, which encompesses 40 children with syncope, the mean value of the years was 9.2 (9). Later, in another study done by Bo et al (15), the investigators followed the complete occurrence of syncope in the pediatric population of Parma, during a 2-year period (2005 – 2006) resulted in 86.5/100.000 per year. The mean age of the patients that were evaluated in this study was 10 years and 6 months (range from 1 to 18 years old), Also, mean age of subjects evaluated in our study was 12 years and 2 months (range from 8 months to 18 years). In the already mentioned study by Fadnis et al. (9) conducted on 40 subjects, Vasovagal syncope (57.5%) was the most common cause of syncope followed by orthostatic hypotension (15%), neurological (15%), cardiac etiology (5%) and idiopathic (7.5%). Regarding the etiology of syncope, autonomic syncope is the most common among our subjects, occurred in even 88/117 or 73%. The possible causes of syncope were different. In most cases, the circumstances were typical: getting out of bed, prolonged standing, uncomfortable sensations, pain. Exercise-related syncope occurs immediately after a period of exercise. It was endurance-trained athletes, who tolerated physical effort. In 26% of these subjects, syncope recurred under typical circumstances. We performed a syncope test on eight subjects and confirmed the diagnosis. Pratt and Fleischer (3) in the already mentioned study have found neurocardiogenic syncope in up to 50% of cases. Massin et al. (16) from a study of 226 cases of syncope in paediatric patients, concluded that the neurocardiogenic mechanism was responsible for 80% of cases. In the same study, Massin et al. diagnosed cardiac arrhythmic syncope in 2% of patients and did not find the real cause.

In our study, the cardiovascular causes of syncope occurred in 5 out of 117 or 4% of patients. Structural cardiovascular alterations corresponding to hypertrophic cardiomyopathy were identified in a male, 11 years of age. In two subjects, cardiac syncope occurred due to heart rhythm disorders, and two ones experienced syncope due to inflammatory heart diseases (myopericarditis). In all subjects with a cardiogenic cause, syncope occurres during physical exertion or exercise.
The group of noncardiogenic syncopes was etiologically diverse. Six cases, out of 24 with non cardiac syncope, were classified as neurological syncope.
Anamnestic data indicated epileptic seizures. As additional tests, EEG recordings were performed and the diagnosis was confirmed. Differential diagnosis between epilepsy and other types of syncope can be difficult.

A brief medical check up, positive family history of epilepsy are causes of diagnostic confusion (17, 18). Similarly, EEG may be normal in 50% of patients with epileptic disorders. The occasional presence of myoclonus or tonic stiffness during a crisis of consciousness can also lead to confusion (19). Jeavons et al. (20), evaluated 200 subjects diagnosed with epilepsy, concluded that 44% of these episodes could be defined as ordinary syncope.
Confusion is possible with the existence of psychogenic syncope that arose as a consequence of conversion disorders. During the loss of consciousness due to conversion, blood pressure and pulse are usually normal related to age and a fall in loss of consciousness does not cause injury.
In addition, conversion disorder can be presented as a psychogenic non-epileptic seizure.
These seizures may occur as an event similar to a generalized tonic-clonic seizure, although the features such as the body movement and eye movement and position (open vs. closed) may indicate the psychogenic nature of the event. In our study of 12 children /out of 24, the cause of syncope was of psychogenic origin. It occurred in 8 females and 4 males. According to the age, in all 12 subjects, syncope as a consequence of conversion occurred between the ages of 14-18. In three subjects ( 3/out of 16) syncope occurred due to affective respiratory crises. It is interesting that in one subject, the crisis of consciousness due to the affective respiratory crisis appeared already in a 8-month-old infant. Metabolic etiology was diagnosed in 3 out of 24 cases of syncope.
Due to hypocalcemia caused by extreme malnutrition, two females of 12 years age had low glycemic values.
A 12-year-old female underwent Magnetic resonance imaging (MRI) of the head due to presyncopal problems and headache complaints, where she was diagnosed with mastoiditis and ethmoid sinusitis.
Dantas et al. (22) used a title table test in 9 subjects (the median age was 11.7 years, range 9 to 16 years) with a suspected epilepsy. This test was positive in all nine subjects because they experienced an identical reaction on the test followed by loss of consciousness.
Certainly, the title-table test is especially useful tool allowing the induction of a syncopal state in controlled conditions and can help distinguish epilepsy from syncope. However, it can also be positive in children diagnosed with epilepsy and should be considered as a primary screening procedure. We agree with other authors (23,24) that it should beused only when the etiology of syncope remains uncertain. In our study tilt table test was performed in 2 cases of syncope with uncertain etiology and was useful to prove neurocardiogenic syncope.

## CONCLUSION

Syncopal episodes are a significant problem in everyday pediatric practice. A detailed medical check-up with complementary diagnostic exploration can make it possible to distinguish the causes of life-threatening causes of syncope from benign neuron-mediated syncope. The application of routine laboratory tests, ECG results, EEG recordings, title test facilitates patient identification, determines diagnostic criteria and determines the possible benefit of the therapeutic approach. As cardiac causes and epileptic seizures have been singled out as the most important differential diagnostic entities, thus the precise diagnostic tests have been given to identify the true nature of syncopal episodes. However, neurocardiogenic syncope is referred as the most common cause of the syncopal episode that is in accordance with other researches. The purpose of this paper is to indicate that a detailed examination by a physician and respecting the set criteria can be a good starting point for further consideration of the therapeutic approach to syncope.

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