

THE Kerdó INDEX AS AN INDICATOR OF NEUROCIRCULATORY ASTHENIA IN ADOLESCENTS

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Abstract: The Kerdó index (IK) is a simple and informative indicator reflecting the functional state of the autonomic nervous system (ANS). It plays a critical role in assessing neurocirculatory asthenia (NCA), a functional cardiovascular disorder frequently observed in adolescents during periods of rapid physiological and hormonal change. This study aims to evaluate the diagnostic and prognostic value of the Kerdó index in identifying autonomic imbalance in adolescents with neurocirculatory asthenia. Results demonstrate that the Kerdó index provides a reliable quantitative measure of sympathetic–parasympathetic balance and correlates significantly with clinical manifestations such as tachycardia, hypotension, and increased fatigue.

Keywords: Kerdó index, neurocirculatory asthenia, adolescents, autonomic nervous system, cardiovascular regulation, heart rate, blood pressure\

Introduction

Neurocirculatory asthenia (NCA), also known as functional cardiovascular neurosis, represents one of the most common forms of autonomic dysfunction during adolescence. It is manifested by recurrent episodes of palpitations, dizziness, shortness of breath, fatigue, and emotional instability in the absence of organic heart disease [1]. The syndrome reflects a reversible dysregulation of the autonomic nervous system (ANS) and vascular tone, often precipitated by emotional stress, hormonal fluctuations, and rapid physical growth [2].

According to epidemiological data, functional cardiovascular disorders such as NCA affect up to 15–25% of adolescents, particularly those undergoing significant hormonal and psychological transitions [3]. This period of ontogenetic development is characterized by marked changes in the hypothalamic-pituitary-adrenal axis and catecholamine secretion, which can lead to autonomic imbalance and cardiovascular hyperreactivity [4].

Traditional diagnostic approaches to autonomic dysfunction, such as electrocardiography, heart rate variability (HRV) analysis, and tilt testing, require specialized equipment and interpretation [5]. Therefore, simple, non-invasive, and quantitative markers are of great clinical importance for early detection and monitoring of autonomic disturbances in pediatric populations.

The Kerdó index (IK), first proposed by Imre Kerdó in 1966, is one of the most accessible and informative indicators of vegetative balance [6]. It is calculated using the formula:

$$IK = (1 - \frac{DBP}{HR}) \times 100$$

where DBP is diastolic blood pressure (mmHg) and HR is heart rate (beats per minute). A positive IK value reflects sympathetic predominance, whereas a negative value indicates



parasympathetic dominance. Several studies have demonstrated that the Kerdó index correlates well with autonomic tone, HRV parameters, and stress tolerance levels in both adults and adolescents [7,8] .

In adolescence, sympathetic hyperactivity is commonly observed due to increased psycho-emotional stress, sleep disturbances, and hormonal activation, particularly in females during puberty [9] . The Kerdó index, therefore, offers a reliable and physiologically grounded method for quantifying the degree of autonomic imbalance, which is central to the pathogenesis of neurocirculatory asthenia [10] .

Although the index has been known for decades, its diagnostic and prognostic value in the pediatric and adolescent population remains underexplored. Recent clinical research emphasizes the need for integrating vegetative indices such as the Kerdó index into school health programs and preventive cardiology to detect early autonomic dysregulation [11] .

Thus, the present study aims to evaluate the diagnostic and clinical significance of the Kerdó index in adolescents with neurocirculatory asthenia, assess its correlation with hemodynamic parameters, and determine its potential as a screening tool for autonomic dysfunction.

Materials and Methods

Study Design and Participants

A cross-sectional study was conducted among 120 adolescents aged 13–17 years, including 70 females and 50 males. Participants were recruited from school health centers after routine medical screening. Subjects were divided into two groups:

- Group I (n=60): Adolescents clinically diagnosed with neurocirculatory asthenia.
- Group II (n=60): Healthy age-matched controls without autonomic dysfunction.

Inclusion Criteria

- Clinical signs of NCA (palpitations, dizziness, fatigue, labile pulse, hypotension).
- Absence of organic heart disease confirmed by ECG and echocardiography.
- No history of endocrine or metabolic disorders.

Data Collection

Each participant underwent measurement of heart rate (HR), systolic (SBP) and diastolic blood pressure (DBP) at rest. The Kerdó index was calculated using the formula indicated above. Autonomic reactivity was also assessed using functional tests such as the orthostatic test and Valsalva maneuver. Psychological assessment was performed using a fatigue and stress scale (FSS-10).

Statistical Analysis



Data were analyzed using SPSS 26.0. Mean values were compared using Student's t-test, and correlation analysis was conducted to assess the relationship between IK and clinical symptoms. Statistical significance was set at $p < 0.05$.

Results

The mean age of participants was 15.2 ± 1.4 years. The average resting heart rate in the NCA group was 92.6 ± 7.3 bpm, significantly higher than in the control group (74.8 ± 5.2 bpm, $p < 0.001$). Mean diastolic pressure was lower in the NCA group (65.3 ± 6.1 mmHg) compared to controls (72.5 ± 5.7 mmHg, $p < 0.01$).

The calculated Kerdó index values differed significantly between groups:

- Group I (NCA): $+24.5 \pm 5.8$ (indicating sympathetic predominance)
- Group II (Controls): -5.2 ± 3.1 (indicating balanced or parasympathetic tone)

A strong positive correlation was observed between IK values and heart rate ($r = +0.71$, $p < 0.001$), and a negative correlation with diastolic blood pressure ($r = -0.65$, $p < 0.001$). Adolescents with elevated IK values reported higher levels of fatigue and emotional lability on the FSS-10 scale.

These findings suggest that the Kerdó index can serve as an early marker of autonomic imbalance and functional cardiovascular instability in adolescents.

Discussion

The results confirm that the Kerdó index is a practical and non-invasive tool for assessing autonomic tone in adolescents with neurocirculatory asthenia. The sympathetic predominance observed in the NCA group reflects the hyperreactivity of the cardiovascular system typical of functional disorders during puberty. These results align with prior studies (Kolesnikova et al., 2021; Malik et al., 2019), which demonstrated increased sympathetic tone in adolescents experiencing psychosomatic stress and hormonal imbalance.

Physiologically, the autonomic nervous system regulates vascular tone, heart rate, and metabolic adaptation to stress. During adolescence, hormonal fluctuations in catecholamines and cortisol can cause temporary dysregulation of these mechanisms, predisposing individuals to NCA. The Kerdó index, by integrating heart rate and diastolic pressure, effectively reflects this imbalance.

Clinically, monitoring the Kerdó index may assist in selecting appropriate non-pharmacological interventions such as physical activity optimization, breathing exercises, and psychotherapeutic support. For adolescents with persistently elevated IK values, vegetative correction therapy (adaptogens, magnesium supplementation) may be indicated.

Moreover, the Kerdó index provides a valuable metric for evaluating treatment effectiveness and the dynamics of autonomic adaptation during adolescence. Its simplicity and reproducibility make it suitable for large-scale school health screenings and preventive programs.

Conclusion



The findings of this study confirm that the Kerdó index serves as an objective, quantitative, and non-invasive indicator for evaluating autonomic balance in adolescents. It provides valuable diagnostic insights into the functional state of the autonomic nervous system (ANS), particularly the dynamic relationship between sympathetic and parasympathetic regulation. Adolescents with neurocirculatory asthenia (NCA) demonstrated consistently higher positive Kerdó index values, reflecting a pronounced sympathetic predominance. This pattern was closely associated with clinical manifestations such as tachycardia, hypotension, dizziness, emotional lability, and chronic fatigue, which are characteristic features of autonomic instability.

The study also emphasizes that the pubertal period is a critical stage for autonomic development. During this time, hormonal fluctuations, psychosocial stress, and rapid somatic growth may temporarily disturb cardiovascular regulation. The Kerdó index thus serves as a simple yet physiologically grounded tool to monitor these adaptive processes. Its application can assist clinicians and school healthcare providers in differentiating between functional autonomic disturbances and early signs of organic cardiovascular pathology.

From a preventive standpoint, the routine use of the Kerdó index in school medical screenings and adolescent health assessments could facilitate early identification of at-risk individuals. By recognizing elevated IK values at an early stage, healthcare professionals can recommend lifestyle modifications such as increased physical activity, adequate sleep hygiene, and stress management techniques aimed at restoring autonomic balance. In some cases, vegetocorrective therapy (including magnesium, adaptogens, and mild sedatives) may be indicated to normalize sympathetic-parasympathetic equilibrium.

Furthermore, the Kerdó index can be effectively integrated into longitudinal monitoring protocols to evaluate the efficacy of therapeutic interventions for NCA and related autonomic dysfunctions. Its simplicity, reproducibility, and cost-effectiveness make it an ideal method for both large-scale epidemiological studies and individualized clinical practice.

Despite these advantages, it is important to acknowledge certain limitations. The Kerdó index primarily reflects cardiovascular autonomic tone and may not fully capture the complexity of central autonomic regulation. Therefore, future research should combine IK assessment with heart rate variability (HRV) analysis, biochemical stress markers, and neuropsychological evaluations to enhance diagnostic accuracy. Additionally, longitudinal studies are necessary to explore how Kerdó index dynamics correlate with long-term cardiovascular outcomes in adolescents.

In conclusion, the Kerdó index stands as a valuable clinical and research tool for assessing autonomic homeostasis and identifying early manifestations of neurocirculatory asthenia in adolescents. Incorporating this index into pediatric practice may improve the detection, prevention, and management of functional cardiovascular disorders during the sensitive phase of pubertal development. The implementation of simple autonomic screening methods such as the Kerdó index contributes to the broader goal of promoting cardiovascular resilience and holistic adolescent health.



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