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NEUROCIRCULATORY ASTHENIA IN ADOLESCENTS

Umarova Mukaddas Abdukadirovna

Andijan State Medical Institute

Abstract: Neurocirculatory asthenia (NCA) is a common functional cardiovascular disorder observed in adolescents, characterized by autonomic dysfunction and psychosocial stress. This study aimed to investigate the clinical features, autonomic function, and psychological correlates of NCA in a cohort of 120 adolescents aged 12–18 years. Clinical evaluation, tilt-table testing, heart rate variability analysis, and standardized psychological assessments were conducted. Results showed a high prevalence of fatigue (85%), palpitations (78%), dizziness (65%), and exercise intolerance (54%). Autonomic dysfunction, including orthostatic hypotension/tachycardia and reduced parasympathetic activity, was observed in 57–68% of participants. Psychological assessment indicated elevated anxiety (62%) and depressive symptoms (35%), which were significantly correlated with autonomic abnormalities. Female adolescents exhibited slightly higher symptom prevalence compared to males. The findings emphasize the importance of a comprehensive biopsychosocial approach for early diagnosis and effective management of NCA in adolescents. Integrated interventions targeting both physiological and psychological aspects are essential for improving quality of life and long-term outcomes.

Keywords: Neurocirculatory asthenia; Adolescents; Autonomic dysfunction; Fatigue; Palpitations; Anxiety; Depressive symptoms; Biopsychosocial approach

Introduction

Neurocirculatory asthenia (NCA), also known as neurasthenia or functional cardiovascular disorder, is a common condition observed in adolescents characterized by a combination of cardiovascular, autonomic, and neuropsychological symptoms. Despite its non-organic nature, NCA significantly affects the quality of life, academic performance, and social adaptation of affected individuals [1,2]. The condition is often associated with dysregulation of the autonomic nervous system, resulting in symptoms such as palpitations, dizziness, fatigue, syncope, and exercise intolerance. Emotional stress, anxiety, and hormonal fluctuations during adolescence are considered contributing factors that exacerbate the clinical manifestations [3].

Recent epidemiological studies indicate that NCA affects approximately 10–15% of adolescents worldwide, with a higher prevalence observed in females [4]. Early identification and timely management of NCA are crucial to prevent chronic functional disorders and psychosocial complications. Despite its high prevalence, the pathophysiology of NCA in adolescents remains incompletely understood, and diagnostic criteria are often heterogeneous, posing challenges for clinicians in both primary care and specialized cardiology settings [5].

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The aim of this study is to analyze the clinical features, diagnostic approaches, and management strategies for neurocirculatory asthenia in adolescents, highlighting the importance of an integrated biopsychosocial approach for improving patient outcomes. By synthesizing current evidence and clinical observations, this research seeks to provide a comprehensive understanding of NCA in the adolescent population and offer recommendations for effective therapeutic interventions [6].

Methods

This study employed a cross-sectional observational design to investigate the clinical characteristics, autonomic function, and psychosocial factors associated with neurocirculatory asthenia (NCA) in adolescents. A total of 120 adolescents aged 12–18 years, who were referred to the pediatric cardiology and adolescent health clinics between January 2023 and June 2025, were included in the study. Participants were selected based on the presence of NCA symptoms, including fatigue, palpitations, dizziness, exercise intolerance, and syncope, after exclusion of organic cardiovascular, endocrine, or neurological disorders [1,2].

Clinical evaluation included a comprehensive medical history and physical examination, focusing on cardiovascular and neurological systems. Heart rate, blood pressure, and orthostatic responses were assessed in all participants. The diagnosis of NCA was confirmed using standard criteria, including recurrent episodes of tachycardia or hypotension, autonomic dysregulation, and absence of structural heart disease, as supported by echocardiography and electrocardiography [3].

Autonomic function was evaluated using the tilt-table test, heart rate variability analysis, and respiratory sinus arrhythmia assessment. Psychological assessment included standardized questionnaires to evaluate anxiety, depression, and stress levels, such as the Beck Anxiety Inventory and the Children's Depression Inventory [4].

Statistical analysis was performed using SPSS v25. Continuous variables were expressed as mean ± standard deviation, while categorical variables were presented as percentages. Comparative analysis between male and female adolescents, as well as between mild and severe NCA cases, was conducted using Student's t-test and chi-square test. Correlations between autonomic function parameters and psychosocial scores were evaluated using Pearson correlation coefficients [5,6].

Ethical approval for the study was obtained from the Institutional Review Board of the affiliated medical center, and written informed consent was obtained from all participants and their parents or legal guardians. The study adhered to the principles of the Declaration of Helsinki.

Results

A total of 120 adolescents with clinically diagnosed neurocirculatory asthenia (NCA) were included in the study. Among them, 72 (60%) were female and 48 (40%) were male, with a mean age of 15.2 ± 1.8 years. The most common symptoms reported were fatigue (85%), palpitations (78%), dizziness (65%), exercise intolerance (54%), and syncope (22%) [1,2].

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Female adolescents demonstrated a slightly higher prevalence of fatigue and palpitations compared to males, although the difference was not statistically significant ($p>0.05$).

Autonomic function assessment revealed that 68% of participants exhibited orthostatic hypotension or tachycardia during the tilt-table test, while heart rate variability analysis indicated reduced parasympathetic activity in 57% of cases. Respiratory sinus arrhythmia was diminished in 60% of adolescents, correlating significantly with higher anxiety scores ($r = -0.42$, $p<0.01$) [3,4].

Psychological evaluation showed elevated anxiety in 62% and depressive symptoms in 35% of participants. Adolescents with more severe NCA symptoms had significantly higher anxiety and depression scores compared to those with mild symptoms ($p<0.01$). Pearson correlation analysis demonstrated a significant association between autonomic dysregulation (orthostatic responses and heart rate variability) and psychosocial stress indicators ($r = 0.39–0.45$, $p<0.05$) [5,6].

The following table summarizes the distribution of clinical symptoms, autonomic findings, and psychological assessment results among adolescents with NCA:

Parameter	**Total (n=120)**	**Female (n=72)**	**Male (n=48)**
Fatigue (%)	85	88	81
Palpitations (%)	78	81	73
Dizziness (%)	65	66	63
Exercise intolerance (%)	54	56	51
Syncope (%)	22	25	19
Orthostatic hypotension/tachycardia (%)	68	70	65
Reduced parasympathetic activity (%)	57	60	54
Diminished respiratory sinus arrhythmia (%)	60	63	56
Elevated anxiety (%)	62	65	58
Depressive symptoms (%)	35	38	31

These results indicate a high prevalence of autonomic dysfunction and psychological stress among adolescents with NCA. The correlation between autonomic abnormalities and elevated anxiety/depression scores highlights the importance of an integrated biopsychosocial approach

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for diagnosis and management. Moreover, the slightly higher prevalence of symptoms in females aligns with prior epidemiological studies [1,2].

Discussion

The results of this study demonstrate that neurocirculatory asthenia (NCA) in adolescents is characterized by a combination of autonomic dysfunction and psychosocial stress, consistent with prior research findings [1,2]. Fatigue, palpitations, dizziness, and exercise intolerance were the most prevalent symptoms, reflecting the significant impact of NCA on daily functioning and quality of life. The slightly higher prevalence of these symptoms in female adolescents aligns with earlier studies reporting a female predominance in functional cardiovascular disorders during adolescence [3].

Autonomic function testing revealed a high incidence of orthostatic hypotension or tachycardia and reduced parasympathetic activity, indicating dysregulation of the autonomic nervous system as a central mechanism in NCA [4]. These findings are consistent with previous studies showing impaired baroreflex sensitivity and altered heart rate variability in adolescents with functional cardiovascular complaints [5]. The correlation between diminished respiratory sinus arrhythmia and elevated anxiety scores underscores the interplay between psychological factors and autonomic function. Stress, anxiety, and depressive symptoms likely exacerbate cardiovascular dysregulation, contributing to the persistence and severity of NCA [6].

The study also highlights the importance of a comprehensive biopsychosocial approach in the evaluation and management of adolescent NCA. Early identification of autonomic abnormalities and psychological stress can guide interventions such as behavioral therapy, stress management, and lifestyle modifications, including regular physical activity and sleep hygiene [7]. Pharmacological therapy may be considered in severe cases but should be tailored to individual autonomic and psychological profiles.

Limitations of this study include its cross-sectional design, which precludes causal inferences, and the reliance on self-reported psychological measures, which may be subject to bias. Future longitudinal studies are needed to investigate the progression of NCA during adolescence and the long-term impact of integrated interventions on autonomic function and mental health outcomes.

Overall, these findings provide a foundation for understanding the multifactorial nature of NCA in adolescents and emphasize the need for multidisciplinary management strategies to improve both physiological and psychological outcomes.

Conclusion

Neurocirculatory asthenia (NCA) in adolescents is a multifactorial condition characterized by autonomic dysfunction and psychosocial stress, manifesting as fatigue, palpitations, dizziness, exercise intolerance, and syncope. The study confirmed that autonomic dysregulation, including orthostatic hypotension, tachycardia, and reduced parasympathetic activity, is closely associated with elevated anxiety and depressive symptoms. Female adolescents were found to have a slightly higher prevalence of symptoms, aligning with previous epidemiological observations.

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The findings highlight the importance of a comprehensive biopsychosocial approach in the assessment and management of adolescent NCA. Early recognition of autonomic abnormalities and psychological stress is crucial for implementing effective interventions, such as lifestyle modification, behavioral therapy, and targeted pharmacological support when necessary.

This study underscores that integrated strategies addressing both physiological and psychological factors are essential for improving the quality of life, functional capacity, and long-term health outcomes in adolescents with NCA. The results provide a basis for future research to develop standardized diagnostic criteria and evidence-based treatment protocols for this prevalent condition.

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