

TRENDS IN ASTHMA CONTROL TEST SCORES BEFORE AND AFTER THE ONSET OF MARTIAL LAW

Yeryomenko G.V.

Kharkiv National Medical University, Kharkiv, Ukraine

<https://doi.org/10.35339/ic.2026.13.1.ygv>

ABSTRACT

Background. During the war in Ukraine, many patients experience an exacerbation of bronchial asthma due to treatment interruptions and limited access to diagnostic facilities, which necessitates a revision of approaches to patient care.

Aim. To determine the role of a remote "Asthma School" in the control of bronchial asthma in patients under martial law.

Materials and Methods. The study included 42 patients with Bronchial Asthma (BA), aged 20 to 60 years, with a disease duration of 5 to 15 years. There were 28 women (66.7%) and 14 men (33.3%). The patients were divided into three groups of 14: Group 1 – mild asthma, Group 2 – moderate asthma, and Group 3 – severe asthma. Four consecutive surveys were conducted using the Asthma Control Test (ACT) before and after the onset of martial law in 2022. Statistical analysis was performed using Excel 2016 (Microsoft, USA) and Statistica 10.0 (StatSoft, USA). To evaluate the trends in questionnaire results over time across the three observation groups, a Two-Way Mixed-Design Analysis of Variance (ANOVA) was conducted. Post-hoc pairwise comparisons were performed using the Tukey HSD test. Data normality was verified using the Shapiro–Wilk test, and the assumption of sphericity was assessed via Mauchly's test. For variables with a normal distribution, the results are presented as Mean $\pm$ Standard Deviation (M $\pm$ SD). The study was conducted as part of the master's thesis "The role of asthma schools in asthma management in a frontline city" (2024–2026).

Research Ethics. The study was conducted in accordance with the Declaration of Helsinki of the World Medical Association (1964–2024). Patients provided informed consent.

Results. At the first and second assessments, all groups showed good asthma control with a trend toward slight improvement. The third assessment (during martial law) revealed a significant decrease in ACT scores in all groups: Group 1 – to [14.2 $\pm$ 1.8], Group 2 – to [16.3 $\pm$ 1.4], and Group 3 – to [19.4 $\pm$ 1.1] ($p < 0.05$). The fourth assessment (after implementation of the remote "Asthma School") showed increases: Group 1 to [17.3 $\pm$ 1.5], Group 2 to [19.2 $\pm$ 1.2], and Group 3 to [20.3 $\pm$ 1.2]. A trend toward restoration of asthma control was observed in Groups 2 and 3 ($p > 0.05$), while statistically significant residual decompensation persisted in Group 1 ($p < 0.05$).

Conclusions. During martial law, a significant decline in asthma symptom control was observed in all groups. The greatest decrease was noted in patients with mild asthma, while patients with severe asthma demonstrated the highest resilience to the negative impact of the war. The introduction of the remote "Asthma School" contributed to a significant improvement in ACT scores.

Keywords: respiratory diseases, patient education, war, monitoring.

Introduction

Asthma is a heterogeneous disease characterized by chronic inflammation of the airways. Among the pathogenetic mechanisms underlying asthma development, a leading role is played by

the interaction between cellular elements (eosinophils, cytokines, T helper cells) and inflammatory mediators, which contribute to bronchial hyperresponsiveness [1]. The clinical manifestations of the disease are accompanied by respiratory symptoms such as wheezing, dyspnea (of the expiratory type), chest tightness, and cough, which vary in time and in intensity [2].

The main feature of asthma is airway obstruction, which is characterized by complete or partial reversibility and serves as a key differential diagnostic marker in the verification of this nosology [3].

Epidemiological data indicate the global prevalence of the disease. In 2021, it was estimated

Corresponding Author:

Yeryomenko Galyna V. – MD, Doctor of Medical Sciences, Professor of the Department of Pro-paedeutics of Internal Medicine, Nursing and Bi-oethics, Kharkiv National Medical University, Ukraine.

✉ 4, Nauky ave., Kharkiv, 61022, Ukraine.

E-mail: hv.yeromenko@knmu.edu.ua

that 260 million (95% CI [227–298]) people worldwide had asthma [4]. In Ukraine, 210 thousand patients with asthma were registered (according to 2015 statistics). Asthma is among the diseases that have the greatest impact on mortality rates or significantly reduce patients' quality of life and are primarily managed at the outpatient level [5].

Over the past three decades, an increase in incidence has been observed in highly industrialized countries, which correlates with urbanization and changes in the environmental profile. At present, the prevalence of asthma has stabilized and averages [10–12]% in the adult population and 15% among children [6].

Despite the multifactorial nature of the disease, the leading contributing factors remain genetic (atopic phenotype), exogenous (aeroallergens, respiratory viral infections), and anthropogenic (tobacco smoking and air pollution) [7].

Asthma is a disease associated with high costs for both the state and the patient. These costs are related not only to medications but also to hospitalizations, emergency medical service calls, outpatient visits, and other healthcare expenditures [8].

The effectiveness of asthma treatment is closely related to patients' adherence to qualified medical recommendations. Insufficient patient awareness of the main factors underlying the development and exacerbations of asthma, as well as of modern therapeutic approaches, leads to the fact that some patients ignore physicians' prescriptions and independently discontinue treatment. Asthma requires long-term and careful adherence to pharmacological regimens, a specific lifestyle, and a number of restrictions. The success of management strategies proposed by specialists depends on compliance with these conditions [9; 10].

Patient education is an essential component of a comprehensive treatment program. In many cases, insufficiently effective treatment, especially among young individuals, is associated with a lack of understanding of the disease, which leads to improper adherence to medical recommendations. The absence of self-management skills and the inability to use medications correctly significantly hinder successful disease control. As a result, exacerbations, hospitalizations, and emergency calls become more frequent, quality of life decreases, and treatment costs increase [11].

One of the ways to improve the effectiveness of asthma treatment is to use educational formats such as Health Schools or "Asthma Schools". The

main purpose of Asthma Schools is to train patients in disease self-management and to enable them to independently control their condition under the supervision of a nurse or physician. Patient education involves establishing a partnership between the patient and the healthcare provider, with continuous assessment and updating of knowledge [12].

For effective treatment, it is important to ensure patient education and the reinforcement of acquired skills in patients with asthma. The most effective way to achieve this goal is through collaboration between the patient and their physician. The key components of such collaboration include: training in the proper use of inhalers; ensuring patient adherence to the prescribed treatment regimen, including medications and other recommendations within an agreed management strategy; providing information about asthma; training in self-monitoring of symptoms or peak expiratory flow; a written asthma action plan describing how to recognize worsening symptoms and how to respond accordingly; and regular assessment of the patient's condition by a physician [13; 14].

Under conditions of military aggression in Ukraine, additional factors contributing to the exacerbation of pulmonary and allergic diseases, including asthma, have emerged alongside traditional risk factors. These include increased exposure to allergens (household animals, chemical compounds, viruses, bacteria) in shelters such as basements, metro stations, and evacuation gathering points. Pollen allergens may be modified under the influence of chemical agents. Disruptions in dietary and hypoallergenic nutrition are also observed. Due to limited access to usual medications, patients may use drugs provided through humanitarian aid, which may differ in excipient composition. Continuous exposure to psychological and post-traumatic stress contributes to immune system impairment [15].

During wartime, patients with asthma face additional and often severe challenges related to limited access to healthcare services, pharmacies, and in-person consultations with specialists. The lack of access to specific diagnostic and functional testing methods, as well as to many essential medications, including those required for emergency care, frequently leads to poor disease control and may cause unpredictable exacerbations [16].

A potential solution to this problem is the expansion of remote patient consultations by healthcare institutions and the development of remote "Asthma School" programs.

The **aim** of the study was to determine the role of a remote "Asthma School" in asthma control among patients during martial law.

Materials and Methods

The study included 42 patients with asthma aged 20 to 60 years (mean age $[41.5 \pm 8.2]$ years). The duration of the disease ranged from 5 to 15 years. There were 28 women (66.7%) and 14 men (33.3%) who were treated in 2020–2022 at the Kharkiv Regional Council "Regional Clinical Hospital" (Kharkiv, Ukraine). Subsequently, the patients attended the "Asthma School".

The patients were divided into three groups.

Group 1 ($n=14$) – patients with mild disease (duration of asthma $[3.5 \pm 1.7]$ years) who did not receive regular Inhaled glucocorticosteroids (ICS) and used Short-Acting β_2 -Agonists (SABA), specifically salbutamol, for treatment.

Group 2 ($n=14$) – patients with moderate disease (duration of asthma $[9.6 \pm 1.8]$ years) who received only standard maintenance therapy during remission, including a combination of ICS and Long-Acting β_2 -Agonists (LABA), as well as SABA for symptom relief.

Group 3 ($n=14$) – patients with severe disease (duration of asthma $[12.4 \pm 1.7]$ years) who received standard maintenance therapy during remission, including a combination of ICS and LABA, oral glucocorticosteroids (prednisolone up to 10 mg per day, administered continuously or intermittently every other day), as well as SABA for symptom relief.

The Asthma Control Test (ACT) is a standardized self-administered questionnaire designed to assess the level of asthma control in patients over the preceding 4 weeks. It consists of five questions that evaluate the frequency of shortness of breath, nighttime awakenings due to asthma symptoms, use of rescue medication, the impact of asthma on daily functioning, and the patient's own perception of asthma control. Each question is scored on a scale from 1 to 5 points, where a higher score indicates better control. The total possible score ranges from 5 to 25 points.

According to the standard ACT scoring system, a total score of 15 points or less indicates uncontrolled asthma, a score between 16 and 19 points indicates partially controlled asthma, and a score of 20 points or more indicates well-controlled asthma. These clinically validated cut-offs are widely used in routine clinical assessment of asthma control.

All patients completed the ACT one month after the initiation of therapy. The first assessment

was conducted in the summer of 2021. The second assessment was performed six months after starting to attend the "Asthma School", which took place in late 2021. The third assessment was carried out another six months later, in the summer of 2022. The fourth assessment was completed at the end of 2022. Thus, two assessments were performed before the onset of martial law, and two during martial law.

Statistical analysis was performed using Excel 2016 (Microsoft, USA) and Statistica 10.0 (StatSoft, USA). To evaluate the trends in questionnaire results over time across the three observation groups, a Two-Way Mixed-Design Analysis of Variance (ANOVA) was conducted. Post-hoc pairwise comparisons were performed using the Tukey HSD test. Data normality was verified using the Shapiro-Wilk test, and the assumption of sphericity was assessed via Mauchly's test. For variables with a normal distribution, the results are presented as Mean $\pm$ Standard Deviation $[M \pm SD]$.

Research Ethics

The research was conducted in accordance with the fundamental principles of Good Clinical Practice (International Council for Harmonization, 1996), the World Medical Association Declaration of Helsinki (1964–2024), the Council of Europe Convention on Human Rights and Biomedicine (April 04, 1997), and the provisions of the Order of the Ministry of Health of Ukraine No.690 of September 23, 2009 (as amended by Order No.523 of July 12, 2012).

All patients provided informed consent for their participation in the scientific study. The informed consent form included the following statement: "By completing this form, the subject agrees to (anonymously) participate in the scientific study", which is also considered to be informed consent.

Results

At the first assessment, asthma control was partially controlled in Group 1 (ACT score $[19.6 \pm 1.4]$), while Groups 2 and 3 showed good control ($[22.4 \pm 1.3]$ and $[21.5 \pm 1.6]$, respectively). At the second assessment, during patients' participation in the "Asthma School" a tendency toward slight improvement was noted, with scores of $[21.5 \pm 1.2]$, $[22.7 \pm 1.3]$, and $[22.5 \pm 1.6]$ in Groups 1, 2, and 3, respectively. All values exceeded the threshold for well-controlled asthma (*Fig.*).

However, the third assessment, conducted during martial law when patients were physically unable to attend sessions, showed a significant decrease in ACT scores across all groups. The most pronounced negative dynamics were observed in

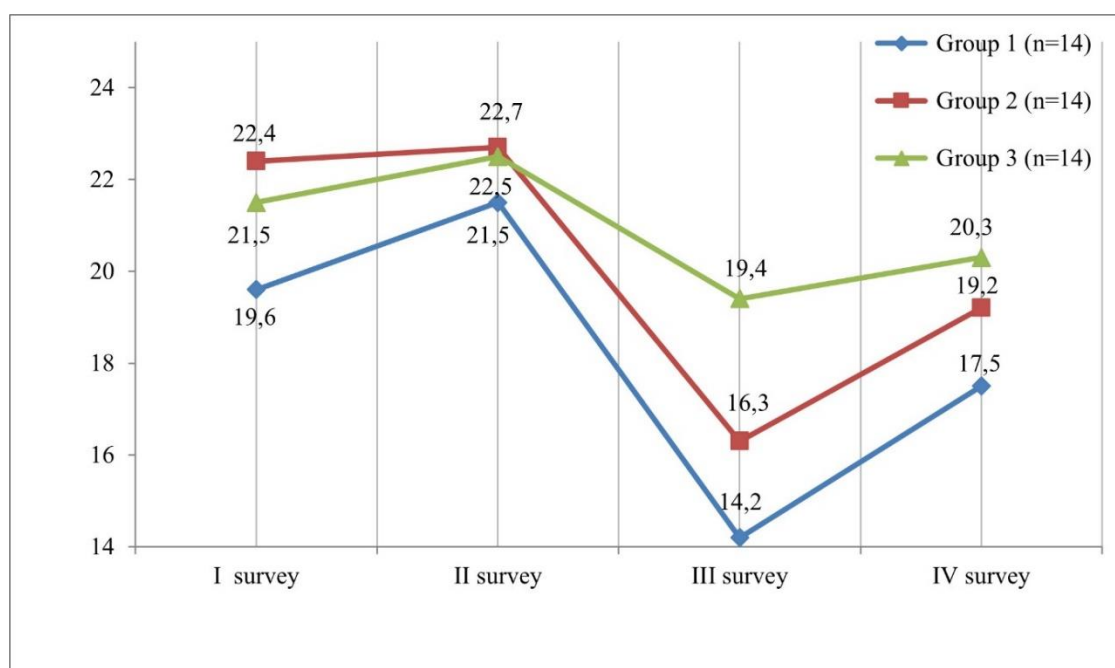


Fig. Trends in patient survey results across the observation groups (n=42).

Group I, where the score decreased by 33.9% compared to the second assessment – from $[21.5 \pm 1.2]$ to $[14.2 \pm 1.8]$ ($p < 0.001$), indicating uncontrolled asthma. Similar but less dramatic declines were recorded in Groups II and III.

In Group 2, a decrease of 28.2% was also observed – from $[22.7 \pm 1.3]$ to $[16.3 \pm 1.4]$ ($p < 0.001$). Possible reasons for these findings include frequent shelling and explosions in the city, relocation of 6 patients from Group 1 and 7 patients from Group 2 abroad, reduced adherence to treatment due to stress, limited access to medical care, and financial difficulties.

In Group 3, only a slight decrease was observed – from $[22.5 \pm 1.6]$ to $[19.4 \pm 1.1]$ ($p < 0.01$), which still indicated relatively stable asthma control. It is possible that the severity of the disease contributed to greater attention to disease management among these patients.

At the fourth assessment, conducted in the context of a remote "Asthma School" implemented via telephone communication between the physician and the nurse, with adaptation of practical recommendations for remote consultations and surveys, an improvement in results was observed. Specifically, ACT scores increased in Group 1 from $[14.2 \pm 1.8]$ to $[17.3 \pm 1.5]$, in Group 2 from $[16.3 \pm 1.4]$ to $[19.2 \pm 1.2]$, and in Group 3 from $[19.4 \pm 1.1]$ to $[20.3 \pm 1.2]$.

Evaluation of the dynamics between the first and fourth assessments demonstrated full restoration of asthma control in patients of Groups 2 and

III ($p > 0.05$), while residual signs of decompensation persisted in Group I ($p < 0.05$).

Discussion

Recently, the European Academy of Allergy and Clinical Immunology supported the Working Group "Managing the Future Increase in Asthma Prevalence Driven by the War in Ukraine" [17]. Unfortunately, the impact of full-scale armed aggression on the quality and effectiveness of therapy in patients with asthma and allergic diseases remains insufficiently addressed in current research [18].

A study by Kovchun A. (2026) [19] included 49 adults with persistent asthma and 21 healthy controls from the city of Sumy in 2024. The authors found that psychological distress significantly increased in both patients with asthma and healthy individuals during periods of intensified hostilities. In patients with asthma, worsening security conditions were associated with a significant decline in FEV_1 and ACT scores ($p < 0.001$). Anxiety negatively correlated with both FEV_1 and ACT throughout the study periods, whereas depression did not show a significant correlation with clinical parameters. Although our study did not assess the impact of depression on asthma control, we also observed the effects of stress and limited access to medical care contributing to decreased ACT scores.

Gemicioğlu B. (2019) [20] followed 1,037 young adult asthma patients (aged < 65 years) and 79 elderly asthma patients (aged ≥ 65 years) over

a 12-month period. The proportion of patients with complete asthma control in the elderly and younger groups was 33.9% and 37.1% at the 1st visit, 20.0% and 42.1% ($p=0.012$) at the 2nd visit, and 50.0% and 49.8% at the 3rd visit, respectively. Treatment adherence was higher in the elderly group compared to the younger group at the 1st visit (72.2% vs. 60.8%, $p=0.045$), the 2nd visit (51.9% vs. 34.9%, $p=0.002$), and the 3rd (32.9% vs. 19.4%, $p=0.004$). Although we did not stratify patients by age in our study, better ACT outcomes were observed in the group with more severe asthma throughout the study period.

Erdoğan E.G. (2024) [21] investigated 200 individuals with poorly controlled asthma who participated in a web-based educational intervention. The web-based education had a statistically significant effect on total scores on the CAFS, ACT, and IDUSTKT scales ($p<0.001$). This intervention reduced fatigue levels, improved asthma control, and enhanced knowledge of inhaler techniques. In our study, the implementation of a remote "Asthma School" during wartime – conducted via telephone consultations between physicians and nurses, with adaptation of practical recommendations to remote counseling and surveys – was also associated with improved ACT scores. Thus, multiple studies confirm the positive impact of remote educational interventions on asthma control, including web-based education, online platforms, and telephone-based follow-up.

Kaidashev I. & Ditiatkovskaya E. (2024) [18], in addressing the management of asthma and allergic diseases during wartime, identified the following key challenges for the Ukrainian healthcare system in the field of allergology:

- 1) reduced accessibility of allergy-related medical care;
- 2) decreased supply of anti-allergic medications and immunotherapeutic agents;
- 3) reduced availability of diagnostic allergy testing.

There is a clear and urgent need for comprehensive large-scale studies in Ukraine to assess the long-term impact of war-related air pollution on allergic diseases and to mitigate the health burden of military conflicts and to protect vulnerable populations from environmental hazards.

References

1. Ji T, Li H. T-helper cells and their cytokines in pathogenesis and treatment of asthma. *Front Immunol.* 2023;14:1149203. DOI: 10.3389/fimmu.2023. 1149203. PMID: 37377958.

Conclusions

Under martial law, a significant decrease in asthma symptom control was observed across all study groups. The most pronounced decline was noted in patients with mild disease, whereas patients with severe asthma demonstrated the greatest resistance to the negative impact of wartime conditions. The implementation of a remote "Asthma School" contributed to a significant improvement in Asthma Control Test scores.

Prospects for Further Research

Future research should focus on elucidating the mechanisms underlying immune system dysfunction induced by wartime-related factors, including chronic psychological stress, chemical exposure, and increased exposure to allergens and infectious agents in bomb shelters. These factors may contribute to disease decompensation and reduced responsiveness to standard asthma therapy. The findings will provide a scientific basis for the development and implementation of personalized remote monitoring strategies and telemedicine-based care for patients with asthma in settings limited access to in-person healthcare.

Funding and Acknowledgments

The study was conducted as part of the master's thesis entitled *The role of asthma schools in asthma management in a frontline city* (2024–2026). The author gratefully acknowledges Kharkiv National Medical University for providing the opportunity to conduct this study on the university's clinical facilities.

Declarations

Conflict of interest is absent.

The author has given consent to the publication of this article under the terms of the Creative Commons BY-NC-SA 4.0 International License and the agreement with the Editorial Board, as well as to the processing and publication of personal data.

The author declares that no generative artificial intelligence (AI) tools or services were used in conducting the study or preparing this manuscript to perform any of the tasks listed in the Generative AI Delegation Taxonomy (GAIDeT, 2025). All stages of the work, from the development of the research concept to the final editing of the manuscript, were completed solely by the author.

2. Feshchenko YuI, Yashina LO, Boiko DM, Gavrysiuk VK, Krakhmalova OO, Matyukha LF, et al. Evidence-Based Clinical Guidelines "Bronchial Asthma". Kyiv: National Academy of Medical Sciences of Ukraine; 2020. 128 p. Available at: <https://is.gd/LINuqD> [in Ukrainian].
3. Zhang M, Pan YL, Bao WP. Comprehensive assessment of bronchial asthma: why it matters? [Chinese Journal of Tuberculosis and Respiratory Diseases]. 2025;48(3):201-4. DOI: 10.3760/cma.j.cn112147-20241214-00739. PMID: 40050072.
4. GBD 2021 Asthma and Allergic Diseases Collaborators. Global, regional, and national burden of asthma and atopic dermatitis, 1990-2021, and projections to 2050: a systematic analysis of the Global Burden of Disease Study 2021. *Lancet Respir Med*. 2025;13(5):425-46. DOI: 10.1016/S2213-2600(25)00003-7. PMID: 40147466.
5. What causes bronchial asthma and how is it treated? Ministry of Health of Ukraine. [Internet]. Available at: <https://moz.gov.ua/uk/chomu-vinikae-bronhialna-astma-i-jak-ii-likujut> [accessed 20 Mar 2026]. [In Ukrainian].
6. Merhej T, Zein JG. Epidemiology of Asthma: Prevalence and Burden of Disease. *Adv Exp Med Biol*. 2023;1426:3-23. DOI: 10.1007/978-3-031-32259-4_1. PMID: 37464114. [In Ukrainian]
7. Zaykov S.V. The allergic phenotype of bronchial asthma: nuances of diagnosis and treatment. *Ukrainian Journal of Pulmonology*. 2021;1:56-8. DOI: 10.31215/2306-4927-2021-29-1-56-58.
8. Dierick BJH, van der Molen T, Flokstra-de Blok BMJ, Muraro A, Postma MJ, Kocks JWH, van Boven JFM. Burden and socioeconomics of asthma, allergic rhinitis, atopic dermatitis and food allergy. *Expert Rev Pharmacoecon Outcomes Res*. 2020;20(5):437-53. DOI: 10.1080/14737167.2020.1819793. PMID: 32902346.
9. Laurence R, Ancel J, Devilliers MA, Carre S, Dury S, Dormoy V, et al. Patient education needs in severe asthma, a pilot study. *BMC Pulm Med*. 2024;24(1):134. DOI: 10.1186/s12890-024-02960-8. PMID: 38491533.
10. Dubin S, Patak P, Jung D. Update on Asthma Management Guidelines. *Mo Med*. 2024;121(5):364-367. PMID: 39421468.
11. Poowuttikul P, Seth D. New Concepts and Technological Resources in Patient Education and Asthma Self-Management. *Clin Rev Allergy Immunol*. 2020;59(1):19-37. DOI: 10.1007/s12016-020-08782-w. PMID: 32215784.
12. Zhang X, Lai Z, Qiu R, Guo E, Li J, Zhang Q, Li N. Positive change in asthma control using therapeutic patient education in severe uncontrolled asthma: a one-year prospective study. *Asthma Res Pract*. 2021;7(1):10. DOI: 10.1186/s40733-021-00076-y. PMID: 34289896.
13. Tan LD, Bakhsh K, Chandak TR. Asthma Management in the Older Adult: THE ABCDE Model for Asthma: Addressing Basics, Challenges, Depression, and Patient-Centered Education. *Clin Geriatr Med*. 2025;41(4):511-24. DOI: 10.1016/j.cger.2025.07.013. PMID: 41198257.
14. Kellerer C, Schultz K, Linde K, Kohler B, Hapfelmeier A, Schneider A. Implementation of an internet-based asthma patient education program in primary care: results of a single-arm trial. *J Asthma*. 2023;60(1):195-202. DOI: 10.1080/02770903.2022.2040027. PMID: 35129399.
15. Feshchenko YuI, Polyanska MO, Opimakh SG, Moskalenko SM, Zvol IV. Risk factors and triggers of bronchial asthma exacerbations during wartime. *Ukrainian Journal of Pulmonology*. 2025;3:5-14. DOI: 10.31215/2306-4927-2025-33-3-5-14. [In Ukrainian].
16. Assessing the environmental impacts of the war in Ukraine. WWF-CEE. [Internet]. Available at: <https://wwfcee.org/our-offices/ukraine/assessing-the-environmental-impacts-of-the-war-in-ukraine> [accessed 20 Mar 2026].
17. Managing the upcoming increase in asthma prevalence caused by the war in Ukraine. European Academy of Allergy and Clinical Immunology. [Internet]. Available at: <https://eaaci.org/task-forces/managing-the-upcoming-increase-in-asthma-prevalence-cause-by-the-war-in-ukraine> [accessed 20 Mar 2026].
18. Kaidashev I, Ditiatkovskaya E. Managing asthma and allergies during the Russo-Ukrainian war. *Ann Allergy Asthma Immunol*. 2024;133(6):720-1. DOI: 10.1016/j.anai.2024.08.032. PMID: 39237033.
19. Kovchun A, Kalpaklioglu AF. How the Asthmatic Patients Handle During War? *Immun Inflamm Dis*. 2026;14(4):e70447. DOI: 10.1002/iid3.70447. PMID: 42011041.
20. Gemicioğlu B, Bayram H, Cimrin A, Abadoğlu O, Cilli A, Uzaslan E, et al. Asthma control and adherence in newly diagnosed young and elderly adult patients with asthma in Turkey. *J Asthma*. 2019;56(5):553-61. DOI: 10.1080/02770903.2018.1471707. PMID: 29714602.

21. Erdoğan EG, Örsal Ö. The effect of web-designed education on medication adherence, asthma control and fatigue in patients with asthma: A randomized controlled trial. *Int J Nurs Pract.* 2024;30(6):e13288. DOI: 10.1111/ijn.13288. PMID: 39031297.

22. Turos OI, Petrosian AA, Maremukha TP, Morhulova VV, Grabovets DM, Brezitska NV, Tsarenok TV. Long-term trends (compared to the pre-war period) and public health impact of surface ozone in Ukraine. *Wiad Lek.* 2024;77(4):703-9. DOI: 10.36740/WLek202404114. PMID: 38865626.

Received: 06 Jan 2026

Accepted: 29 Mar 2026

Published: 31 Mar 2026

Cite in Vancouver style as: Yeryomenko GV. Trends in asthma control test scores before and after the onset of martial law. *Inter Collegas.* 2026;13(1):7p. In press. <https://doi.org/10.35339/ic.2026.13.1.ygv>

Creative Commons license (BY-NC-SA) Yeryomenko G.V., 2026