

Prevalence rates and numbers of persons newly recognized as having a disability due to eye disease or injury (2019-2024) in Ukraine

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Первинна інвалідність населення України внаслідок захворювань і травм органа зору (2019–2024 рр.)

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Abstract

Purpose. To examine the dynamics of the prevalence rates and numbers of persons recognized as having a disability due to eye disease and eye injury among adult population and working-age population of Ukraine and their features under conditions of martial law.

Methods. This was a single-center, cohort study. Prevalence rates and numbers of persons newly recognized as having a disability in Ukraine were retrospectively assessed on the basis of 2019-2024 reports by regional medical and social

expertise (MSE) centers. Medical and social expert cases of 831 patients for the year 2024 were prospectively reviewed in detail. Temporal changes in prevalence rates and numbers of persons newly recognized as having a disability among adult population and working-age population were assessed.

Results. In Ukraine, the total number of persons newly recognized as having a vision disability in 2019 was 4043, which corresponded to an annual prevalence of 1.3 per 10,000 adults. During 2019-2021, the annual prevalence tended to decrease, and was 1.0 per 10,000 adults in 2020 and 1.2 per 10,000 adults in 2021 (the number of adults newly recognized as having a vision disability was 3578). With the beginning the full-scale war, the parameter increased to 3.0 per 10,000 adults in 2023 and 2024. In Ukraine, the total number of adults newly recognized as having a vision disability due to eye injury was 524 (with an annual prevalence of 0.2 per 10,000 adults) in 2019. During 2019-2021, this parameter tended to decrease, and was 1.0 per 10,000 adults in 2020 and 1.2 per 10,000 adults in 2021. However, the total number of adults newly recognized as having a disability due to eye injury increased to 928 (0.3 per 10,000 adults) in 2023 and 831 (0.3 per 10,000 adults) in 2024.

Conclusion. The proportion of persons recognized as having a disability due to eye injury was 12% during pre-war years (2019-2021), and decreased to 10.6% in 2022, 9.4% in 2023 and 10.1% in 2024. It is, however, important that the number of persons recognized as having a disability due to eye injury increased 2.2-fold from 380 in 2021 to 831 in 2024.

Keywords: disability, eye disease, eye injury, military conflict

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Резюме

Мета роботи. Дослідити динаміку показників інвалідності серед дорослого та працездатного населення внаслідок захворювань і травм органа зору в Україні та їх особливості в умовах військового стану.

Матеріал та методи. Дослідження за своїм видом було одноцентровим, когортним. Ретроспективно вивчали показники первинної інвалідності в Україні згідно зі звітами обласних центрів медико-соціальної експертизи впродовж 2019–2024 років; проспективно – аналіз медико-соціальних експертних справ 831 пацієнта у 2024 р. Вивчалася динаміка статистичних показників первинної інвалідності серед дорослого та працездатного населення.

Результати. У 2019 р. в Україні вперше було визнано інвалідами по зору 4043 особи, що відповідало інтенсивному показнику 1,3 на 10 тис. дорослого населення. Впродовж 2019–2021 рр. показник мав тенденцію до зниження – 1,0 на 10 тис. у 2020 р. та 1,2 на 10 тис. у 2021 р. (3578 осіб). Після початку повномасштабного військового конфлікту спостерігається зростання показника до 3,0 на 10 тис. у 2023 і 2024 рр.

Introduction

The International Agency for Prevention of Blindness Vision Atlas (IAPBVA) estimated [1] that, globally, in 2020, 43.3 million individuals were blind (best corrected visual acuity [BCVA] worse than 0.05) and 295 million had moderate to severe visual impairment (MSVI; BCVA worse than 0.3 but equal to or better 0.05). Particularly, 3.7 million people were blind and 157 million had MSVI due to uncorrected refractive error (URE), 17 million people and 83 million, respectively, due to cataract, 2 million people and 6 million, respectively, due to age-related macular degeneration (AMD), 4 million people and 4 million, respectively, due to glaucoma, and 1 million people and 3 million, respectively, due to diabetic retinopathy (DR). In 2020, 77.3% of people with blindness and MSVI had an avoidable cause, defined as cataract or URE; increasing to 90.9% if near vision impairment is included [1]. The risk of vision loss increases with age, and the majority of those with vision loss (73%) are aged 50 years and older. It was estimated that, globally, the annual cost of potential productivity losses of MSVI and blindness was \$410.7 billion [2].

The IAPBVA estimated [3] that, in Ukraine, 170 thousand individuals were blind and 2.14 million had MSVI in 2020 [3]. Part of the problem is that eye diseases and trauma can lead to disability. In Ukraine, the annual prevalence of people recognized as having a vision disability due to eye pathology (including that due to eye injury) was relatively stable during 2018-2022, with an average annual prevalence of 1.7 per 10,000 adults, and 1.5 per 10,000 working-age population [4].

Eye injury is a leading cause for seeking emergency care in the United States and is the second only to cataract

У 2019 р. в Україні внаслідок травм ока вперше було визнано особами з інвалідністю 524 особи, що відповідало інтенсивному показнику 0,2 на 10 тис. дорослого населення. Впродовж 2019–2021 рр. цей показник мав тенденцію до зниження до 0,1 на 10 тис. у 2020 і 2021 рр. Однак з початком військових дій загальна кількість осіб з інвалідністю внаслідок травм очей зростає до 0,2 на 10 тис. у 2022 р. та до 0,3 на 10 тис. у 2023 і 2024 рр. (928 і 831 особа відповідно).

Висновки. В дослідженні встановлено, що питома вага кількості осіб з інвалідністю внаслідок травм ока становила у період 2019–2021 рр. в середньому 12%. У воєнний період частка травм зменшилася до 10,6% у 2022 р.; 9,4% у 2023 р. та 10,1% у 2024 р. Але важливо, що в абсолютних цифрах визначалася чітка тенденція до підвищення кількості визнаних особами з інвалідністю внаслідок травм ока: 831 особа у 2024 р. порівняно з 380 особами в 2021 р., що відповідає збільшенню даного показника у 2,2 раза.

Ключові слова: інвалідність, захворювання органа зору, травми органа зору, військовий конфлікт.

as the most common cause of visual impairment [5]. Over 2 million eye injuries occur each year in the United States as a result of trauma [3, 5]. The most common types of eye trauma are wounds with an intraocular foreign body (IOFB) (35%), open-globe injuries (25%), contusions (25%) and eye burns (15%) [6, 7]. Previously, prevalence rates of ocular trauma ranged from 14.4% up to 21.1% in Western countries, where young males with a low socioeconomic status, poor education levels, or engaged in labor-intensive occupations mostly have a high risk of ocular trauma [3, 8]. Asian population-based studies reported that the prevalence of ocular trauma was 4.4% in the Chinese population of Singapore and 2.1-3.6% in the Chinese population of China regions [9].

In a study by Hoskin and colleagues [10], 13 hospitals in 7 countries used International Globe and Adnexal Trauma Epidemiology Study (IGATES) platform. Patients presenting between April 2009 and 2020 with OGI (with or without) adnexal involvement or IOFB were included. Four hundred fifty-four (64%) patients had visual acuity (VA) < 6/60 at presentation and 327 (44.8%) at final follow-up. Most patients were young adults, the male to female ratio was 6:1, and mean age 36.0 ± 20.0 years old [10].

Blindness and MSVI have been recognized as major causes of restricted activities of daily living, and issues of eye care service delivery have been actively discussed in Ukraine. In this connection, a national strategy to combat blindness, particularly, for prevention of vision disability, in Ukraine for the period until 2030 was substantiated [11].

Studies show that the eye accounts for 13-16% of all combat injuries in modern wars (which is six-fold higher

than in World Wars I and II), and ocular injuries were the fourth most common injury among patients with combat injuries [12].

The main causes of eye injury have changed with advances in techniques and weaponry of warfare, with blast fragmentation injuries accounting for 50–80% of cases. Penetrating and perforating injuries are most common, and injuries associated with intraocular foreign bodies not only pose special diagnostic and management problems, but also can cause a complete loss of vision and disability. Injuries are bilateral in 15–25% of cases. Injuries associated with chemical, nuclear, and laser weapons have distinct characteristics and epidemiology. Enucleation was commonly performed at the turn of the century, but incidence has declined with better understanding of the pathophysiology of ocular trauma, improved surgical techniques and sepsis control with antibiotics [13].

The Russian invasion of Ukraine launched in February, 2022, caused numerous eye injuries among military personnel and civilians, generating a serious epidemiological threat related to vision loss. Although the conflict has been ongoing for over three years, comprehensive information regarding the extent of eye trauma sustained in the war in Ukraine remains limited [14]. Some historical data suggest an upward trend in eye trauma prevalence, although the data sources require cautious interpretation. For example, references indicate that the frequency of eye traumas in Ukrainian conflicts has ranged from 0.65% during the Crimean War in the 1850s to 7.0%–14.0% during the Anti-Terrorist Operation in eastern Ukraine in 2014 [14, 15].

The purpose of this study was to examine the dynamics of the prevalence rates and numbers of persons recognized as having a disability due to eye disease or injury among adult population and working-age population of Ukraine and their features under conditions of martial law.

Material and Methods

This paper is part of the research program “Improving Scientific Methodology Approaches to Determining the Criteria for Signs of Sustained Disability and Optimizing the Programs for Rehabilitation of Patients and Disabled Individuals” for 2025-2028 (State Registration No. 0124U005028) by the Department of Medical and Social Expertise and Rehabilitation, Dnipro State Medical University. The study was conducted at State Institution “Ukrainian State Research Institute for Medical and Social Problems of Disability of Ministry of Health of Ukraine”.

This single-center, cohort study was conducted in two phases. In the first phase of the study, the prevalence and numbers of people newly recognized as having a vision disability in Ukraine were retrospectively assessed on the basis of 2019-2024 reports by regional medical and social expertise (MSE) centers [16-20]. In the second phase of the study, medical and social expert cases (Form 088/o) of 831 patients (distribution by disability groups: group I, 20.7%; group II, 22.5%; and group III, 56.8%) for the year

2024 were reviewed in detail. Patients with eye disease or eye injury were eligible if they were assigned to a disability group during the period examined. Patients were not eligible if they were not assigned to a disability group after their application to ophthalmological medical and social expert commissions (MSEC) during the period examined. Criteria for disability were sustained visual dysfunction and associated restricted activities of daily living due to eye disease or eye trauma resulting in social handicap, with the individual requiring support from the state based on the official state regulations acting during the study [21]. Visual function impairments (mainly, visual acuity impairment and visual field impairment) were described using medical criteria.

We estimated changes in the number and prevalence (per 10,000 adult population or working-age population) of people newly recognized as having a vision disability due to eye disease or eye injury and the percent of individuals assigned to a particular disability group among individuals assigned to any disability group. The prevalence was calculated as the number of people newly recognized as having a vision disability divided by the number of inhabitants in Ukraine and multiplied by the constant 10,000.

Due to the institution of martial law in Ukraine since 24 February, 2022, the State Statistics Service suspended the public release of current data on demographic situation in Ukraine; that is why while calculating the number and annual prevalence of people newly recognized as having a vision disability, we used the latest available statistical data for Ukrainian regions as of 1 January, 2022. This study conforms to the ethics principles of the Declaration of Helsinki on human research and the European Convention on Human Rights and Biomedicine, and relevant laws of Ukraine.

Microsoft Excel (Microsoft Office Professional 2019, Redmond, WA, USA) was used to present statistical data.

Results

It is reasonable to consider disability due to eye injury while assessing interrelated characteristics, the incidence and prevalence of disability due to injury and the incidence and prevalence of disability due to eye pathology as a whole.

We found that, in Ukraine, the total number of people newly recognized as having a vision disability due to eye pathology in 2019 was 4043, which corresponded to an annual prevalence of 1.3 per 10,000 adults. During 2019-2021, this parameter tended to decrease, and was 1.0 per 10,000 adults in 2020 (the number of adults newly recognized as having a vision disability was 3234, which was 20.1% smaller than in 2019) and 1.2 per 10,000 adults in 2021 (the number of adults newly recognized as having a vision disability was 3578, which was 10.1% smaller than in 2019).

Subsequently, with the beginning of Russian military aggression, the number of people newly recognized as

having a disability due to eye pathology increased to 5429 in 2022 (which corresponded to an annual prevalence of 1.8 per 10,000 adults, with a significant increase by 51.7% compared to 2021).

In 2023 and 2024, the annual prevalence of people newly recognized as having a vision disability was 3.0 per 10,000 adults, which was 70.0% greater than in 2022 and three times greater than in 2020 (Figs. 1 and 2).

The annual regional prevalences of adults newly recognized as having a disability due to eye pathology in 2024 for Ivano-Frankivsk region (5.5 per 10,000 adults), Vinnytsia region (4.8 per 10,000 adults), Odesa region (4.8 per 10,000 adults), Chernigiv region (4.2 per 10,000 adults), and Poltava region (4.1 per 10,000 adults) were

greater, whereas those for Lugansk region (0.2 per 10,000 adults), Kherson region (0.5 per 10,000 adults), Donetsk region (0.7 per 10,000 adults), Khmelnytskyi region (1.7 per 10,000 adults), Kharkiv region (2.5 per 10,000 adults), and the city of Kyiv (2.4 per 10,000 adults) were smaller compared to an average annual national prevalence of 3.0 (per 10,000 adults).

The total number of adults recognized as having a disability due to eye injury was 562 (with an annual prevalence of 0.2 per 10,000 adults) in 2019; 435 (an annual prevalence of 0.1 per 10,000 adults) in 2020; 380 (0.1 per 10,000 adults) in 2020; 510 (0.2 per 10,000 adults) in 2022; 928 (0.3 per 10,000 adults) in 2023; and 831 (0.3 per 10,000 adults) in 2024 (Figs. 3 and 4). Therefore, the

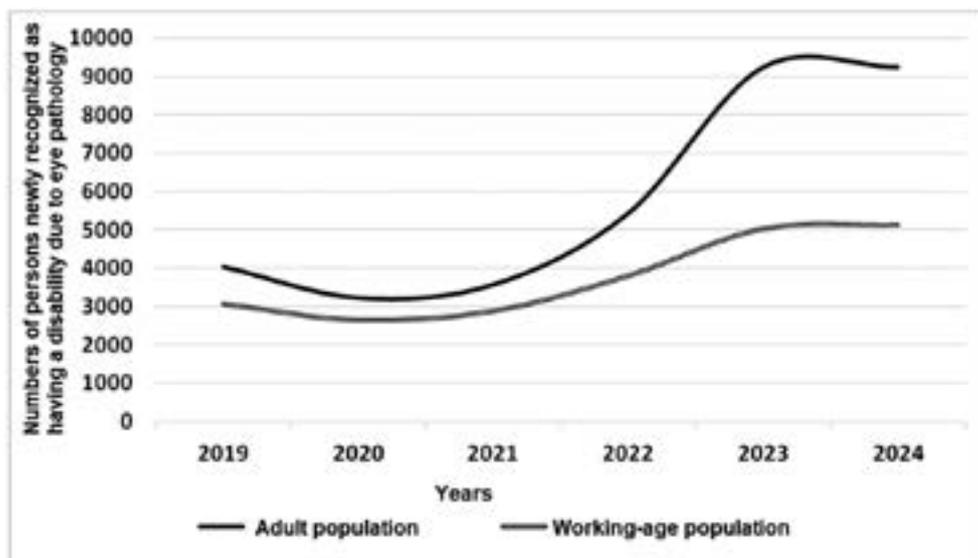


Fig. 1. Total numbers of persons newly recognized as having a disability due to eye pathology among adult population and working-age population of Ukraine in 2019 – 2024.

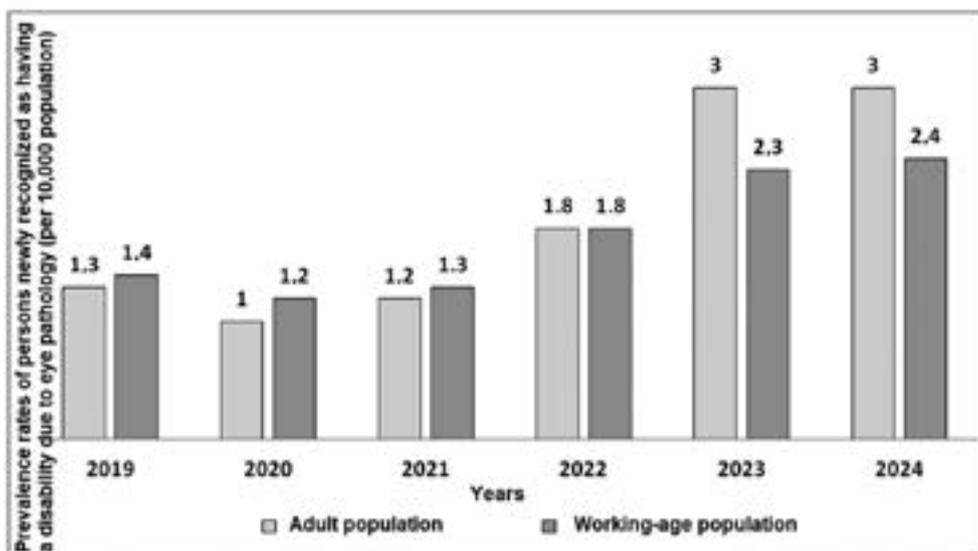


Fig. 2. Prevalence rates of persons newly recognized as having a disability due to eye pathology among adult population and working-age population of Ukraine in 2019 – 2024.

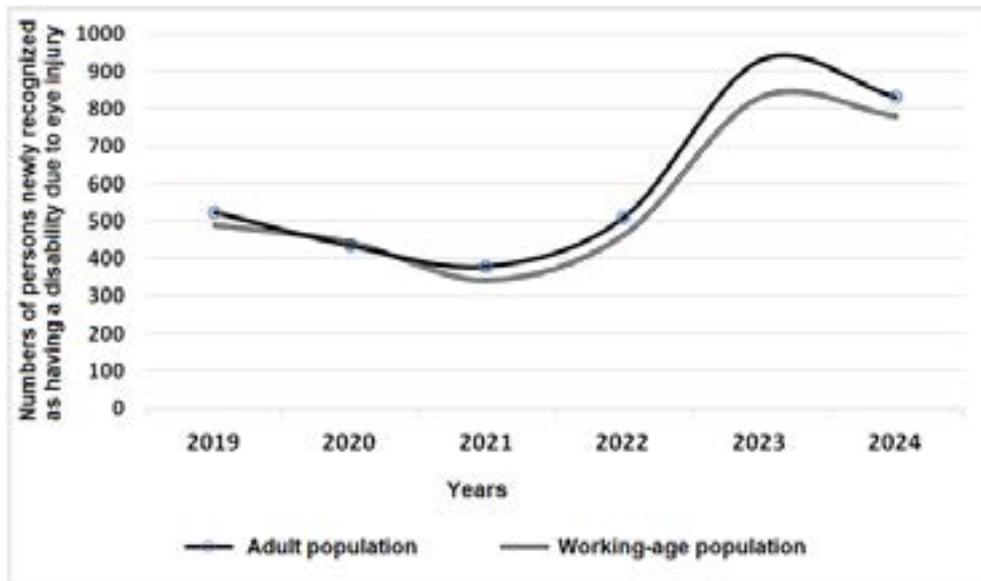


Fig. 3. Total numbers of persons newly recognized as having a disability due to eye injury among adult population and working-age population of Ukraine in 2019 – 2024.

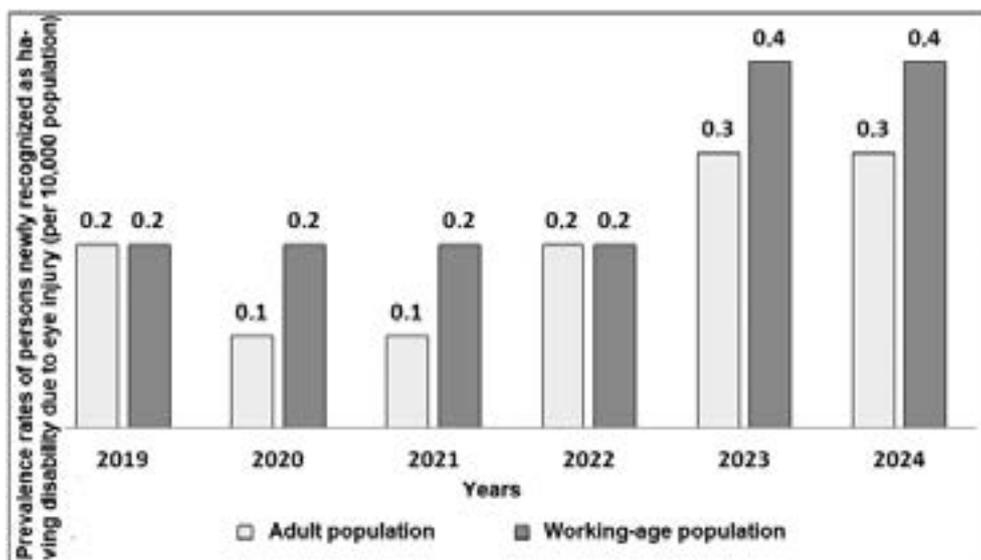


Fig. 4. Prevalence rates of persons newly recognized as having a disability due to eye injury among adult population and working-age population of Ukraine in 2019 – 2024

annual prevalence of adults recognized as having a vision disability due to eye injury has practically tripled since the introduction of martial law in Ukraine.

The total number of working-age people newly recognized as having a disability due to eye injury for the first time was 491 (with an annual prevalence of 0.2 per 10,000 working-age population) in 2019; 444 (0.2 per 10,000 working-age population) in 2020; 344 (0.2 per 10,000 working-age population) in 2021; 464 (0.2 per 10,000 working-age population) in 2022; 831 (0.4 per 10,000 working-age population) in 2023; and 781 (0.4 per 10,000 working-age population) in 2024 (Figs. 3 and 4).

Therefore, the annual prevalence of working-age people recognized as having a disability due to eye injury has practically doubled since the introduction of martial law in Ukraine.

Hence, we found that both the annual prevalence of working-age people and the annual prevalence of adult people newly recognized as having a vision disability due to eye injury have significantly increased since the introduction of martial law in Ukraine.

The annual regional prevalences of people newly recognized as having a vision disability due to eye injury in 2024 for Zhytomir region (0.9 per 10,000 adults),

Dnipropetrovsk region (0.7 per 10,000 adults), Mykolaiv region (0.6 per 10,000 adults), Kirovograd region (0.6 per 10,000 adults), and Odesa region (0.5 per 10,000 adults) were greater, whereas those for Zaporizhzhia region (0.01 per 10,000 adults), Donetsk region (0.03 per 10,000 adults), Kherson region (0.05 per 10,000 adults), and Ivano-Frankivsk region (0.05 per 10,000 adults) were smaller compared to an annual national prevalence of 0.4 (per 10,000 adults).

We found that the severity of eye pathology leading to the recognition of disability also increased since the beginning of the war. Thus, the percent of individuals assigned to disability group III among individuals recognized as having a vision disability ranged from 63.4% to 71.5% during recent pre-war years (2019-2022), and did not exceed 56.8% in 2023 and 2024. Additionally, the percent of individuals assigned to disability group II among individuals recognized as having a vision disability ranged from 14.9% to 17.6% during 2019-2022, and increased to 21.5-22.5% in 2023 and 2024. Moreover, the percent of individuals assigned to disability group I among individuals recognized as having a vision disability increased from 11.9% in 2020 to 24.2% in 2023. Therefore, the percent of individuals assigned to disability group I or II among individuals recognized as having a vision disability increased from 29.5% to 41.7%.

It is noteworthy that the annual prevalence of adults newly recognized as having a disability due to blindness for the first time was 1.4 per 10,000 adults (totally, 9238 adults) in 2023 and 1.0 per 10,000 adults (totally, 9230 adults) in 2024. This is in agreement with the pre-war prevalence of disability among adults with any vision impairment or blindness, which explains an increase in the severity of eye pathology leading to disability in the war period.

The annual prevalence of working-age people newly recognized as having a disability due to blindness was 0.8 per 10,000 individuals (totally, 1692 individuals) in 2023 and 0.6 per 10,000 individuals (totally, 1338 individuals) in 2024, which was about 2.5 times greater than during the pre-war years.

Discussion

Ukrainian pre-war studies demonstrated that the annual prevalence of individuals recognized as having disability due to eye pathology for the first time was relatively stable during pre-war years, with an average annual prevalence of 1.2-1.3 per 10,000 adults, and 1.2-1.4 per 10,000 working-age population [1, 8, 16-20].

In the current study, we found a tendency to worsening in the annual prevalence of people newly recognized as having disability due to eye pathology (including the consequences of eye trauma), which was caused by war actions at the territory of Ukraine. During 2022-2024, the annual prevalence of adults newly recognized as having disability due to eye pathology ranged from 1.8 to 5.0 per

10,000 adults, which was almost three-fold greater than during 2019-2022.

The proportion of individuals with a recognized vision disability due to eye injury was 12% during pre-war years (2019-2021), and decreased to 10.6% in 2022, 9.4% in 2023 and 10.1% in 2024. It is, however, noteworthy that the number of individuals with a recognized disability due to eye injury increased 2.2-fold from 380 in 2021 to 831 in 2024.

We also found that the proportion of individuals with a recognized disability due to severe eye disease or injury increased during the war period. Thus, the proportion of individuals that could not take care of their basic needs (that is, those assigned to disability group I or II) did not exceed 30% in the pre-war period and increased to almost half of all individuals with a newly recognized vision disability during the war period.

The findings of this study are in agreement with those of other studies by Ukrainian authors on the prevalence and severity of eye diseases and eye injuries during the full-scale war in Ukraine [14, 15]. It is important to note that, since January 1, 2025, a significant transformation of the medical and social expertise system has taken place in Ukraine. The MSECs have been abolished, and their functions (assigning a person to a disability group and providing statistical reports) have been transferred to the Expert Teams for the Assessment of Daily Functioning (ETADF) in cluster and supracluster healthcare facilities. Given the fact that eye diseases and eye injuries are increasingly important during wars, we believe that further disability-related research is warranted based on new legislative provisions related to the biopsychosocial disability model. Further research will be focused on determining which rehabilitation techniques and actions are most effective for preventing disability due to eye pathology, particularly eye injury.

Conclusion

First, our findings demonstrated a negative effect of the military activities at the territory of Ukraine due to Russian aggression on the annual prevalence of people recognized as having a disability due to eye pathology (particularly, eye injury). Thus, during 2022-2024, the annual prevalence of adults recognized as having disability due to eye pathology ranged from 1.8 to 5.0 per 10,000 adults, which was almost three-fold greater than during 2019-2022. Additionally, the annual prevalence of adult individuals newly recognized as having a vision disability due to eye injury has practically tripled since the introduction of martial law in Ukraine.

Second, we found that, during the war years, there was an increase in the proportion of severe eye pathology (including eye injury and blindness) leading to disability. Thus, the proportion of individuals assigned to disability group I or II among adults recognized as having a vision disability was 1.5 times greater during the war years than

during the pre-war years, which may be explained by war-related latent disability. It is important that, in the war period, the prevalence of disability due to eye injury was higher among working-age population (0.4 per 10,000 working-age population) than adult population (0.3 per 10,000 adults). In the war period, the annual prevalence of working-age people newly recognized as having a disability due to blindness was 0.6-0.8 per 10,000 working-age people, which was about 2.5 times greater than during the pre-war years.

Finally, annual regional prevalences of individuals newly recognized as having a vision disability due to eye disease and eye injury were lowest in the regions of active combat operations. This fact may be due to (1) a certain organizational pattern in the operation of expert commissions under conditions of long curfew hours and frequent air alerts, and (2) reduction in population due to forced migration to safer regions.

Author Contributions

DVV: Conceptualization, Project Administration, Data Analysis; ISB: Conceptualization, Project Administration, Data Collection and Interpretation, Investigation, Writing – review and editing; LGI: Conceptualization, Project Administration, Investigation, Data Interpretation; ISA: Investigation, Data Interpretation, Writing - original draft preparation; KDK: Data Collection and Analysis. All authors reviewed the results and approved the final version of the manuscript.

Disclaimer

This manuscript reflects the views of the authors and may not reflect the views of their institution.

Conflict of interest

The authors state that they have no conflicts of interest that could influence their views on the subject matter or material described or discussed in this manuscript.

Sources of support

None.

Ethical Statement

This study involved human subjects, was approved by the local bioethics committee, and followed ethical standards as outlined in the Declaration of Helsinki of the World Medical Association. This study did not include animal experiments.

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