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**CHANGES IN THE MORBIDITY AND PREVALENCE  
OF MENTAL AND BEHAVIORAL DISORDERS OF CHILDREN LIVING IN THE WARZONE  
IN EASTERN UKRAINE**

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The article is devoted to the dynamics of morbidity and prevalence of mental morbidity and behavioral disorders of children in Donetsk and Luhansk regions, where war conflict is taking place. Also we wanted to compare this indicator to national ones and to determine the possible impact of the ongoing war on their development. Children from warzone have an increased morbidity and prevalence of mental morbidity and behavioral disorders in comparison with national levels. It has become possible due to chronic stress and other adverse factors. This situation requires creation and implementation of state and regional programs for medical, psychological and social support to children from these regions with mental morbidity and behavioral disorders, in order to improve their quality of life and social adaptation.

**Keywords:** children, mental and behavior disorders, warzone

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**ЗМІНИ ЗАХВОРЮВАНОСТІ ТА ПОШИРЕНОСТІ РОЗЛАДІВ ПСИХІКИ ТА ПОВЕДІНКИ  
ДІТЕЙ, ЯКІ ПРОЖИВАЮТЬ В ЗОНІ БОЙОВИХ ДІЙ НА СХОДІ УКРАЇНИ**

Робота присвячена оцінці динаміки захворюваності та поширеності розладів психіки та поведінки у дитячого населення Донецької і Луганської областей, де відбуваються бойові дії, у порівнянні з загальнодержавними показниками з метою визначення можливого впливу наслідків триваючої війни на їх розвиток. У дітей з Донецької та Луганської областей внаслідок хронічного стресового стану і ряду інших несприятливих факторів спостерігається зростання захворюваності і поширеності розладів психіки та поведінки з перевищенням загальнодержавних рівнів і збільшення кількості дітей з інвалідністю внаслідок розладів психіки і поведінки. Зазначене вимагає створення і реалізації державної та відповідної регіональної програми щодо забезпечення постійного медичного, психологічного і соціального супроводу дітей з цих регіонів, з метою поліпшення їх якості життя та соціальної адаптації.

**Ключові слова:** діти, захворюваність, поширеність, порушення поведінки і психіки, зона бойових дій.

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War has been lasting in eastern Ukraine for the past five years, distorting the lives of people and children living in the areas of conflict. According to the Research Report "Children Affected by the Armed Conflict in Ukraine" the number of children affected by the war in the East of the country is about 200,000. [1].

Back in 2014, UNICEF performed a study of the socio-psychological condition of children in Donetsk region, which discovered an increased level of stress among nearly 25 % of children aged 3–6 years, in every sixth child aged 7–12 years and among 25 % children aged 13–18 years. A lot of children with physical and mental health problems need help [2].

Military actions directly and indirectly lead to chronic stress of the population, especially children. War destroys the child's habitual world, where he felt safe, distorts his perception of reality and the future [4, 8].

Chronic stress arises as a result of tragic events witnessed by children: violence, cruelty, loss of relatives and friends, forced change of residence and study, and the information war. Subsequently, such child may get post-traumatic stress disorder, which can lead to the mental and behavioral disorders (hereinafter – MBD) [6, 7, 9, 11].

Panchenko O.A. and Tsapro N. (2016) discovered significant changes in the state of cardiovascular and nervous systems, different metabolic disorders, disruption of menstrual cycle in girls, and pathological changes in the thyroid gland of children who permanently live near the conflict zone [8].

According to Beketova G.V. and co-authors (2020) a child's MBD can lead to a numerous psychosomatic diseases, including bronchial asthma (BA) and gastrointestinal pathology [12].

Due to the prevalence of MBD among the population, the Ministry of Health of Ukraine declares the transition from providing psychiatric care to maintaining the mental health of the population, which should be a part of the reform of the mental health care system.

**The purpose** of the study was to assess of the dynamics of morbidity and prevalence of mental and behavioral disorders of children in Donetsk and Luhansk regions, where hostilities are taking place, in comparison to national morbidity level in order to determine the possible impact of the ongoing war on their development.

**Materials and methods.** The data of the Center of Medical Statistics of Ukraine Health Ministry on the state of mental health of children in the country were used in the analysis of the dynamics of morbidity and prevalence MBD of children from Donetsk and Luhansk regions [3].

In order to compare the indicators of disability, morbidity and prevalence of MBD of children from Donetsk and Luhansk regions and national indicators from 2010 to 2019, statistical evaluation methods were used, in particular W – Wilcoxon-Mann-Whitney test. Statistical processing of the study results was performed using the software product STATISTICA 6.1 (StatSoftInc.) And Excel-2010. The difference in the compared groups was considered significant at a level of statistical significance (p) less than 0.05.

The study was conducted in accordance to the basic conceptions of the ICH GCP and the Helsinki Declaration on the Ethical Principles of Medical Research Relating to Human Subjects and its Revisions (Seoul, 2008), the Council of Europe Convention on Human Rights and Biomedicine (2007), and recommendations of the Bioethics Committee at the Presidium of the National Academy of Medical Sciences of Ukraine (2002).

**Results of the study and their discussion.** According to the Center of Medical Statistics of the Ministry of Health of Ukraine, the incidence of MBD of children aged 0–17 years in the last year of available statistical analysis data from the Ministry of Health of Ukraine (2017) amounted to 29,008 new cases of MBD or 3.81 per 1,000 children.

In the dynamics of the past years there has been a decrease in the MBD morbidity of children [15]. Prevalence of MBD in older children (0–17 years) was 195,495 cases or 25.67 per 1,000 children. Over the past eight years, the level of diagnosis of MBD of children has decreased by 34.4 %. It should be noted that children from the zone of armed conflict in Donetsk and Luhansk regions had higher rates of both prevalence and morbidity of MBD than national rates (fig.1 and table 1).

Table 1

**Indices of MBD in children from the zone of armed conflict and children in Ukraine according to the Center for Medical Statistics of the Ministry of Health of Ukraine (2017)**

No.	Name	Prevalence		Morbidity	
		absolute numbers	per 1,000 children	absolute numbers	per 1,000 children
1.	<b>(6.0) Mental and behavioral disorders F00-F99</b>				
	<b>Ukraine</b>	<b>195 495</b>	<b>25.67</b>	<b>29 008</b>	<b>3.81</b>
	Donetsk region	10 138.0	33.01	1 261	4.11
	Luhansk region	2 931.0	27.04	525	4.84
2.	<b>Mental and behavioral disorders due to alcohol consumption</b>				
	<b>Ukraine</b>	<b>962.0</b>	<b>0.013</b>	<b>646.00</b>	<b>0.009</b>
	Donetsk region	74.0	0,025	16.00	0.005
	Luhansk region	11.0	0,011	2.00	0.002
3.	<b>Mental and behavioral disorders due to drug use</b>				
	<b>Ukraine</b>	<b>246.0</b>	<b>0.0325</b>	<b>176.0</b>	<b>0.0023</b>
	Donetsk region	38.0	0.0127	19.0	0.0063
	Luhansk region	3.0	0.0029	3.0	0.0029
4.	<b>Mental and behavioral disorders due to the use of all groups of psychoactive substances</b>				
	<b>Ukraine</b>	<b>2 586.0</b>	<b>0.034</b>	<b>2 157.0</b>	<b>0.028</b>
	Donetsk region	133.0	0.044	41.0	0.013
	Luhansk region	14.0	0.014	5.0	0.004
5.	<b>Epilepsy</b>				
	<b>Ukraine</b>	<b>23583.0</b>	<b>3.25</b>	<b>3579.0</b>	<b>0.45</b>
	Donetsk region	2444.0	3.69	327.0	0.49
	Luhansk region	951.0	2.84	149.0	0.45

In our opinion, this is a consequence of the constant stress of these children as a result of the ongoing war. It could manifest in the form of non-psychotic mental disorders, primarily – disorders of psychological development, autism spectrum disorders and epilepsy.

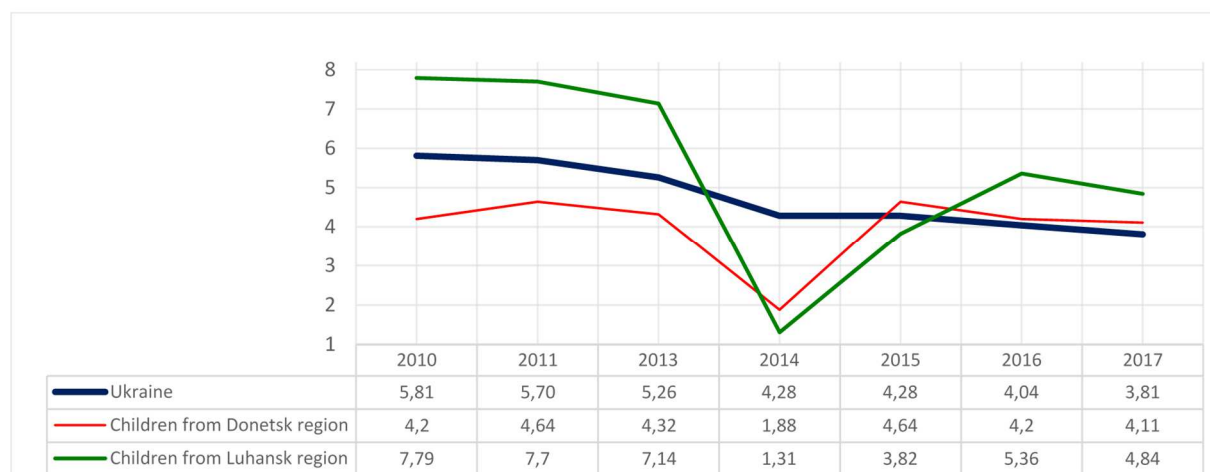


Fig. 1. Comparative dynamics of the morbidity of MBD of children in Ukraine and children living in the warzone (2010 – 2017) per 1,000 children.

First of all, these disorders are the results of chronic activation of the sympatho-adrenal system, which may lead to the depletion of neuro-humoral mechanisms of adaptation of the child to changes in the environment, which has become aggressive towards him. These adaptational mechanisms are existed for preparing an active motor response to a possible stimulus or threat of the type “fight-or-fly”. However, modern or complicated stressful factors and problems that may cause them, unfortunately, cannot be solved by such a primitive reflex reaction. Thus, the child's body continues to spend resources on unproductive response, which depletes his adaptive systems.

In Luhansk region, the morbidity rates of injuries and intoxications, diseases of the musculoskeletal system and connective tissue, diseases of the skin and subcutaneous tissue was higher than the national incidence rates. The prevalence of respiratory diseases also showed a tendency to increase, which corresponds to the general trends in the incidence of respiratory pathology.

In Donetsk region, the morbidity levels of cerebral palsy, trauma and intoxications, diseases of the musculoskeletal system, diseases of the urinary system, diseases of the endocrine system and diseases of the digestive system were higher than national ones. In this area, children had an increase of prevalence of bronchial asthma, diseases of the blood and blood-forming organs, congenital anomalies.

It is extremely worrying that in the structure of morbidity of children with MBD from the zone of armed conflict is mainly consists from mental disorders associated with the use of alcohol, drugs (mainly cannabinoids) and psychoactive substances. Thus, the number of newly detected cases of drug use by the children in both regions was higher than the national level. Among the possible reasons for this we could name a chronic stress due to the proximity of the war zone and the desire of children to escape from this reality.

Over the past 8 years, the morbidity of mental and behavioral disorders of children in Ukraine has significantly decreased. In our opinion, it is associated with insufficient diagnostics of these conditions and reduced provision of regions and cities with qualified medical personnel.

The same trend was typical for the morbidity level of mental and behavioral disorders of children of Luhansk region. However, in Donetsk region, on the contrary, in recent years there has been one of the largest increases in the morbidity of children with MBD (by 23.0 %), relative to the MBD morbidity in this region in 1993. While among the children from Luhansk region, the MBD morbidity has decreased by 28.5 % over the past decades.

There was a great decrease of detection of MBD in both regions in 2014, mainly due to the start of war in Donbass and the difficulties in obtaining statistical information.

The morbidity of children with MBD during the 8-year period was decreased from year to year, and the rates of children in both regions, where war began in 2014, started to grow. At the same time, the morbidity rates of children with MBD from Luhansk region significantly exceeded the national morbidity rate – by 27.03 % ( $p < 0.05$ ). The morbidity level of MBD of children from Donetsk region exceeded the national level less significantly – by 7.9% ( $p > 0.05$ ).

In the age structure of MBD morbidity both in the country and in the regions, ravaged by war, the detection of these pathological conditions among adolescent population prevailed – 4,382 cases of MBD

were detected or 4.06 per 1,000 of the relevant population (in Donetsk region – 2.64 per 1,000 children, in the Luhansk region 5.89 per 1,000 children). While the morbidity level of MBD of children of the first six years of life was slightly lower – 11,920 or 3.77 per 1000 children (in Donetsk region – 4.48 per 1,000 children, in Luhansk region – 4.92 per 1,000 children). Among children aged 6 to 14 years, the highest number of children with newly diagnosed MBD has reached 12,706 or 3.76 per 1,000 children (in Donetsk region – 4.29 per 1,000 children, in Luhansk region – 4.43 per 1,000 children). It is noteworthy that in all age groups, the morbidity level of MBD of children from war areas, has significantly exceeded the national mean. Exceptions were only the morbidity levels of MBD in adolescents from Donetsk region, which were slightly lower, apparently due to insufficient detection of MBD.

Such increase of morbidity can be observed even from an early age, where the morbidity of children with MBD sometimes exceeds the morbidity of children of school age. It can be explained by the early and direct impact of war and chronic stress state of their families and environment on children from Donetsk and Lugansk regions from the very first years of life.

In the age structure of the prevalence of MBD both in the country and in the regions where the war goes on, the maximum detection of these pathological conditions in adolescents also prevailed and 37760 cases of MBD were detected or 34.96 per 1,000 population (in Donetsk region – 38.3 per 1,000 children, in Luhansk region - 39.6 per 1000 children). Meanwhile the prevalence of MBD of children of the first six years of life was significantly lower than 45800 or 14.49 per 1,000 children (in Donetsk region – 21.4 per 1,000 children, in Luhansk region – 19.4 per 1,000 children). Among children aged 6 to 14 years, the largest quantity of children with MBD was found in numerical terms – 111935 or 33.16 per 1,000 children (in Donetsk region – 43.37 per 1,000 children, in Luhansk region – 29.02 per 1,000 children).

This corresponds to the data that at the end of school the number of perfectly healthy children is constantly decreasing but the number of children with one to two or three chronic diseases is increasing. Mental and behavioral disorders occupy the 2nd place among such population because of significant overload due to the busy school program [3].

Most notable that in all age groups prevalence of MBD in population from warzone exceeds the nationwide MBD level. Such dynamics has been observed since an early age and then the prevalence of MBD progressively increases with the age. Exceptions are only in the indexes of the morbidity among schoolchildren from Luhansk region, which were slightly lower.

The ratio of indicators of the prevalence of the disease to the morbidity reflects the index of accumulation of chronic pathology (hereinafter – IACP). It should be noted that this indicator in case of MBD exceeded the total IACP of children for 5 times, which indicates a complex and often resistant to therapy MBD since an early age.

IACP at MBD of children aged 0–6 years also significantly exceeded the national rate by 3.3 times, which indicates a rapid development of MBD, which begins at the age from 0 to 6 years. In this age cohort the IACP at the MBD of children from Donetsk and Luhansk regions exceeded the national indicator, which indicates the difference and more grave severity of MBD of children from the warzone. The process of accumulation of chronic pathology in case MBD continued at the age from 7 to 14 years. The only difference was the decrease IACP at MBD among children of Luhansk region both in this age cohort and in teenagers.

IACP at MBD had the highest value among teenagers, where it reached 8.67, which is 5.1 times higher than IACP in age 15 to 17 years in the country, which was equal to 1.7 (table 2). It should also be noted that the IACP at MBD of children of Donetsk region was by 1.67 times higher than the mean IACP at MBD among children of the country.

Table 2

**Comparison of the index of accumulation of chronic pathology of children in Ukraine and children from Donetsk and Luhansk regions of different age groups with mental and behavioral disorders**

Residence	Index of accumulation of chronic pathology of children			
	Children aged 0-6 years.	Children aged 7-14 years.	Children aged 15-17 years.	Children aged 0-17 years.
Ukraine	3.84	8.32	8.67	6.73
Donetsk region	4.77	10.11	14.5	8.03
Luhansk region	3.95	6.55	6.72	4.97

According to the Center for Medical Statistics of the Ministry of Health of Ukraine in 2019, 27052 children with disabilities were registered having MBD or 35.7 per 10 thousand children, among whom 3,587 children (4.7 per 10 thousand children) had a disability diagnosed firstly at last year, which accounted for 22.0 % of the total number of children with disabilities (fig. 2). Over the past 10 years, the

rate of primary disability due to mental disorders of children in Ukraine has increased by 51.6 %, and the total disability has increased by 21.4 %. Mental retardation, autism spectrum disorders, epilepsy occupy leading positions among the causes of disability, connected with MBD.

At the same time, according to the Center for Medical Statistics of the Ministry of Health of Ukraine in 2019, in the war regions was registered a highly increased rate of disability of children with MBD:

– 1,719 children with disabilities were registered in Donetsk region as a result of MBD or 57.3 per 10 thousand children, among them 206 children (8.9 per 10 thousand children) disability was first found out in 2019, which amounted to 27.5 % of the total number of children with disabilities in the region;

– in Luhansk region, 390 children with disabilities were registered as a result of MBD or 37.6 per 10 thousand children, among them 55 children (5.3 per 10 thousand children) disability was first found out in 2019, which amounted to 24.7 % of the total number of children with disabilities in the region.

The indices of onset of primary disability as a result of MBD currently significantly exceed the national parameters ( $p < 0.05$ ). The indicator of general disability was significantly increased only for children from Donetsk region. It should be noted that the indicators of general and primary disability due to MBD of children from Luhansk and Donetsk regions were slightly higher than the national level in the pre-war period, but in 2015 they began to grow sharply (fig. 2, 3).

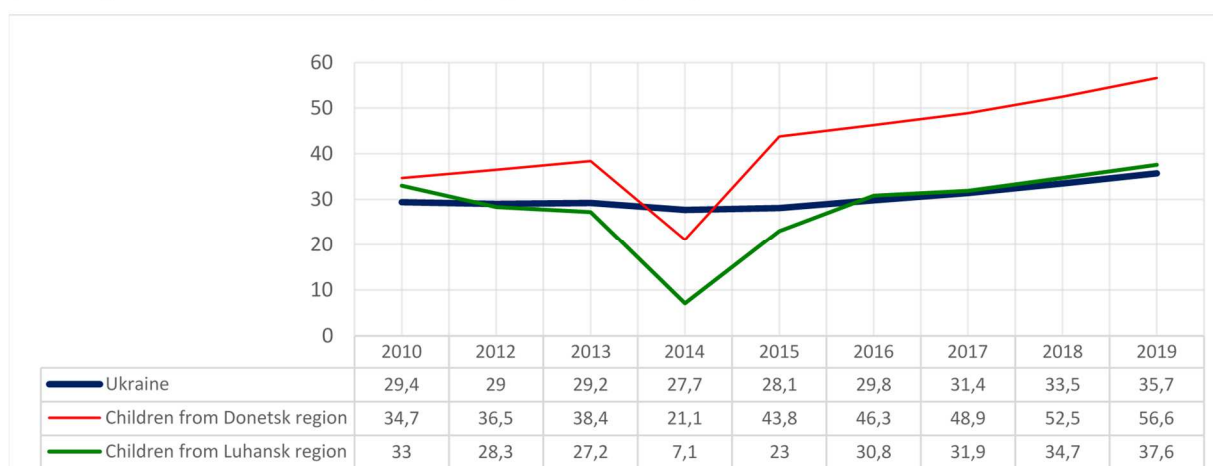


Fig. 2. Comparative dynamics of the disability rate due to MBD of Ukrainian children and children living in the warzone (2010 - 2017) per 10,000

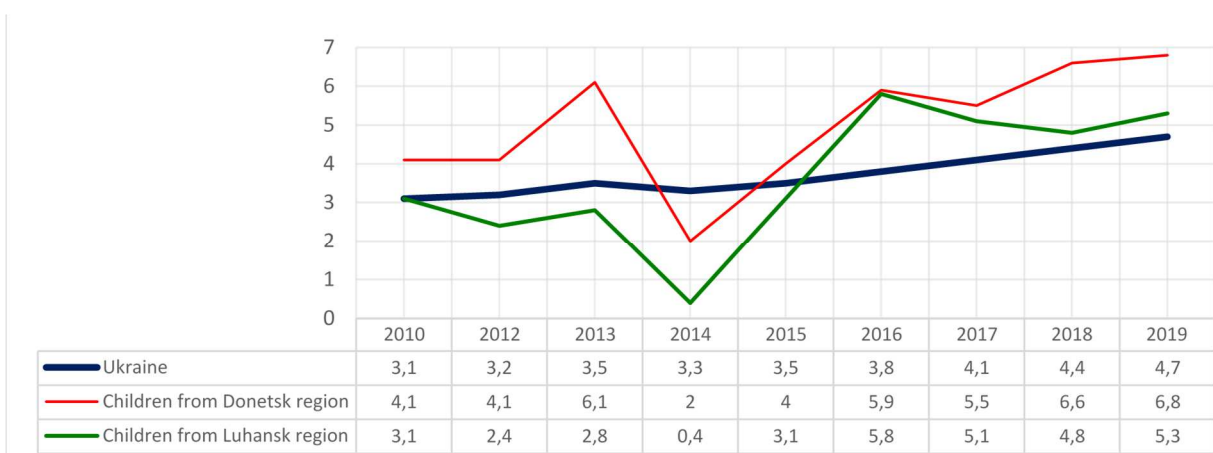


Fig. 3. Comparative dynamics of the indicator of primary disability due to MBD of Ukraine children and children living in the war zone (2010 - 2017) per 10,000 children.

Over the past 10 years, the rate of primary disability due to mental disorders in the Donetsk region increased by 65.8 %, and for children from Luhansk region – by 70.9 %. At the same time, the increase in disability due to MBD in the country was only 51.6%. The index of total disability due to MBD for the same period of time increased for children from Donetsk region by 63.1 %, and for children from Luhansk region – by 14 %.

This indicates a negative trend in the increase in the number of children with disabilities due to MBD in the regions with active war compared to pre-war indicators.

Such exhaustion results in both psychological disorders (neurosis, accentuation, impaired productive communication with the world) and various psychosomatic disorders (functional immunodeficiency, decreased cognitive function, somatoform autonomous nervous system disorders, etc.) [5, 10, 13, 14].

In support of described situation we have discovered that the incidence of epilepsy, infectious diseases, respiratory diseases, bronchial asthma, pneumonia, cardiovascular diseases, and oncological diseases has increased in the war-torn areas compared to national incidence rates. At the same time, this does not correspond to some indicators of the study of the children health state from the warzone of the Institute of Child and Adolescent Health of the National Academy of Medical Sciences of Ukraine [4].

### Conclusion

According to the results of our study, we came to a conclusion that morbidity, prevalence of MBD and disability because of mental and behavioral disorders among the children from Donetsk and Luhansk regions, where war has been taking place for the last 5 years, increased due to a number of unfavorable factors.

This situation requires the creation and implementation of a general state and relevant regional program for providing ongoing medical, psychological and social support to children with MBD, living in these regions, in order to improve their quality of life and social adaptation.

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