IMPACT OF STRESS FACTORS ON UKRAINIAN WAR VICTIMS IN THE COUNTRY AND ABROAD

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Summary

The purpose of the study was to estimate the frequency of the most probable stress factors and behavioural disorders based on the our own survey results among Ukrainians in accordance with the place of residence. The study was conducted from January to August 2023 and included 160 participants, divided into 3 groups: 1 group – those who remained in their hometown (n=80), 2 – internally displaced people (n=49), 3 – participants, living abroad (n=31). A deterioration in the quality of sleep and nutrition was often found among patients in group 2 and 3, common stress factors in these groups included loss or change of job and low socialization. In group 1, sleep disturbances were caused by traumatic experience, changes in work and its conditions affected the frequency of smoking, alcohol abuse and the quality of nutrition. In order to reduce the severity or eliminate behavioural risk factors, special attention should be paid to overcoming the consequences of traumatic experiences among people who remain in their hometown, to integrating internally displaced persons into society, and to immediate providing psychological support to people living abroad.

Key words: war in Ukraine, armed aggression against Ukraine, behavioural risk factors, questionnaire, sleep disturbances, poor nutrition, smoking, alcohol consumption.

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1. Introduction

During an armed conflict, both the physical and mental components of the health of the country's residents are negatively affected. Thus, epidemiological studies of depression and post-traumatic stress disorder (PTSD) among citizens in war-affected regions have yielded heterogeneous estimates of the prevalence of these conditions *(Morina et al., 2018).* Available surveys have shown that 26% and 27% of war survivors have PTSD and/or depression, respectively. Older age was also found to be associated with a higher prevalence of depression, and higher levels of unemployment were associated with a higher prevalence of PTSD. Results of another study, based on a survey among Ukrainians in 2012–2016, revealed that the conflict was associated with the development of chronic diseases only in the last year of the sample, and the impact of the conflict on mental health in Ukraine was more significant away from the conflict zone, probably due to differences in exposure to mass media and social networks, cultural differences (e.g. language) or ethnic groups *(Osiichuk, Shepotylo, 2020).* According to the results of a 2019 systematic review, which included 65 studies (34% of which were of medium and high quality) and assessed the consequences of 23 military conflicts in different countries, armed conflict was associated with the deterioration of the physical health of the population, namely with an increase in the risk of coronary heart disease (CHD), cerebrovascular and endocrine diseases, as well as an increase in mean arterial pressure *(Jawad et al., 2019).* Moreover, not only the prevalence of CHD and non-specific heart diseases has increased, but also the mortality from these pathologies, the prevalence of diabetes mellitus (DM) and arterial hypertension (AH) have also increased among the population. Among cardiovascular disease (CVD) risk factors that have been associated with armed conflicts, the most common were increases in both systolic and diastolic blood pressure. Among behavioural CVD risk factors significantly increased the prevalence of smoking and alcohol consumption because of armed conflicts. Although the presence of stress is often associated with the development of obesity or overweight, no evidence of an association between armed conflict and changes in body mass index (BMI) was found. In contrast, the authors of a study among the population of Aleppo, Syria, found that prolonged armed conflict was associated with a high prevalence of obesity (43.2%) *(Al Ali et al., 2011).* Regarding behavioural risk factors, 82.3% of the population had low physical activity, 39.0% smoked, and 33.4% did not follow a healthy diet. All the results of the above studies indicate that the population of countries where armed conflicts took place, is especially in need of timely and high-quality primary prevention of the development of chronic non-infectious diseases, mainly CVD.

Stress factors are common to both mental and physical pathologies *(Krantz et al., 2022, Meng et al., 2021).* Therefore, it is especially important in modern conditions to know and timely identify stress factors and the disorders caused by them. Currently, there is a very limited amount of data on such disorders and the most common factors of their occurrence. The emergence of behavioural risk factors belongs to the negative consequences that arise first and can be easily noticed even in the absence of medical experience. Such factors include deterioration of nutrition, quality of sleep and work regime, reduced physical activity, alcohol abuse, and smoking. These same factors also belong to cardiovascular risk (CVR) factors, which, against the background of the increased share of CVD during armed conflicts, requires special monitoring. Although there are almost no studies on lifestyle changes of the civilians as a result of military operations, there are many studies that connect other stressful factors (change in marital status, shift work, etc.) with the development of the behavioural risk factors mentioned above *(Deguchi et al., 2022, O'Connor et al., 2021).* Therefore, under martial law conditions, in addition

to the direct traumatic impact because of hostilities, possible stress factors can be attributed to changes in working conditions, social isolation or reduction of social interactions, feelings of security and comfort, etc. Unexpected results were obtained from a longitudinal cross-sectional study in the city of Lausanne, Switzerland *(Abolhassani et al., 2019).* The authors compared the quality of life of adults over 65 years old, born in 1934–1938 (pre-war period), 1939–1943 (war period) and 1944–1948 (baby boom). Although overall satisfaction with quality of life did not differ between cohorts, despite higher educational attainment within cohorts and a shift between pre-war and wartime cohorts towards lower morbidity and a higher proportion of singles, the "feeling of security" among those born during the war was significantly higher compared to other cohorts, which shows that the prevalence of stress factors and the severity of their impact on the quality of life and health of people can differ significantly when comparing population cohorts in the pre-war, war and post-war period. Still, it remains unclear which of the above factors have the most pronounced influence on the deterioration of a person's lifestyle precisely under the martial law conditions.

In addition, for effective screening and timely correction of newly detected pathologies, it is important to understand which category of people is at risk of developing stress-related disorders. It is known that the forced migration of the population during the conflict can contribute to the spread of infectious diseases and, as a result, an increase in the number of chronic diseases and disabilities due to a decrease in immunity and compensatory capabilities of the body *(Roberts et al., 2017).* Therefore, not only the prevalence of stressors but also the severity of the negative impact of stressors may differ between people who have left their homes compared to those who have not.

Considering the presence of a large number of unsolved questions regarding the risk factors of stress-related disorders in the conditions of martial law, the aim of our study was to assess the frequency of the most probable stress factors and to identify related behavioural disorders among Ukrainians, depending on their current place of residence.

2. Materials and methods

From January to August 2023, 160 residents of Ukraine of various ages, who annually underwent regular examinations at the " L.T. Mala Therapy National Institute of the National Academy of Medical Sciences of Ukraine" (Kharkiv, Ukraine) until 2022 year inclusive, participated remotely in the study. All patients were divided into 3 groups, depending on the place of residence at the time of the survey: 1 group – participants who remained in their hometown (n=80), 2 – internally displaced people (n=49), 3 – participants who lived abroad after the beginning of the armed conflict (n=31). Patients were also divided into groups by age: 18–29, 30–49, 50–59, 60–69 years and >70 years.

Germany, Poland, Lithuania, Ireland, the Czech Republic, Bulgaria, Romania, Switzerland, Denmark, Finland, the USA, Belgium, Morocco, Norway, and Canada belonged to the countries in which the participants of group 3 lived. The largest share of surveyed patients lived in Germany (n=14, 42.4%). It was found that some patients of group 1 (n=2, 2.5%) and group 2 (n=3, 6.1%) left Ukraine, but later returned. In addition, patients of all groups had the experience of changing their place of residence within Ukraine during the war until the time of the survey: in group 1 – 36.3%, in group 2 – 93.9%, in group 3 – 71.0%.

As a questionnaire we used "Our own questionnaire for determining health status, assessment of behavioural, socio-economic and cultural factors" (Fadieienko, 2021: Appendix 11, pp 241–244). In all patients we assessed behavioural risk factors for the development

of CVD, the severity of which could change during military time due to differences in stress factors. Such behavioural factors included violations of the regime and quality of nutrition, sleep, physical activity, an increase in frequency and intensity of smoking, and alcohol abuse. Changes in these factors were evaluated by patients within 6 months before the beginning of the survey. Self-reports on nutrition assessed following factors: insufficient nutrition or inability to purchase high-quality products, deterioration of nutrition; self-reports on sleep disorders included deterioration in quality, duration, mode; among harmful habits, we assessed the presence and increase in the frequency of smoking and alcohol abuse; self-reports on physical activity included assessment of intensity and frequency of physical exercises during the week.

Data on anthropometric parameters of the subjects, including height and weight, were also collected. Changes (increase or decrease) in the respondent's weight during the 6 months before the start of the survey were assessed as another CVD risk factor.

The list of probable stress factors included the following parameters:

• *quality of life* based on assessment of residential comfort, financial resources, availability of hobbies, feeling of safety on the street and at home, quality and availability of medical care, including specialized care;

• *social involvement* based on the assessment of integration into a group, associations, social circles, the ability to share one's thoughts, ideas, the need to make decisions about others, self-assessment of one's usefulness and significance for other people, care of relatives/family, friends/acquaintances for the interviewee;

• *work* based on an assessment of its availability (including its loss), change of profession, deterioration of working conditions or reduction of wages;

• *traumatic factors* directly related to military actions, as well as the frequency and severity of their impact, for example, the interviewee witnessed airstrikes, artillery shelling, was injured as a result of these events, saw the bodies of killed civilians, lost acquaintances/relatives/friends as a result military operations.

In addition, in order to assess the most obvious general consequences of the negative impact of various risk factors on the general state of human health in wartime conditions, we chose to evaluate self-reports on whether the patient had new pathologies or whether there were changes in treatment during six months prior the beginning of the survey.

Statistical processing of the obtained data was carried out using the computer program SPSS 21.0 for Windows XP. The analysis of the studied parameters with regard to the normality of the distribution was carried out according to the Kolmogorov-Smirnov test. Quantitative and qualitative variables were used in the statistical analysis. Qualitative data were presented as percentages; quantitative – in the form of the average and standard error of the average ($M \pm m$). Student's t-test was used to compare quantitative indicators. The frequency of symptoms in the groups was compared using the Pearson $\chi 2$ test (chi-square). One-factor variance analysis was used to study the influence of factors. Testing of the hypothesis about the homogeneity of variances in the compared groups was carried out using Levene's test. For all types of analysis, differences were considered statistically significant at $p<0.05$.

3. Results and discussion

There were no significant differences between groups in body weight, height and BMI ($p>0.05$). The results of the assessment of anthropometric status are presented in **fig. 1**.

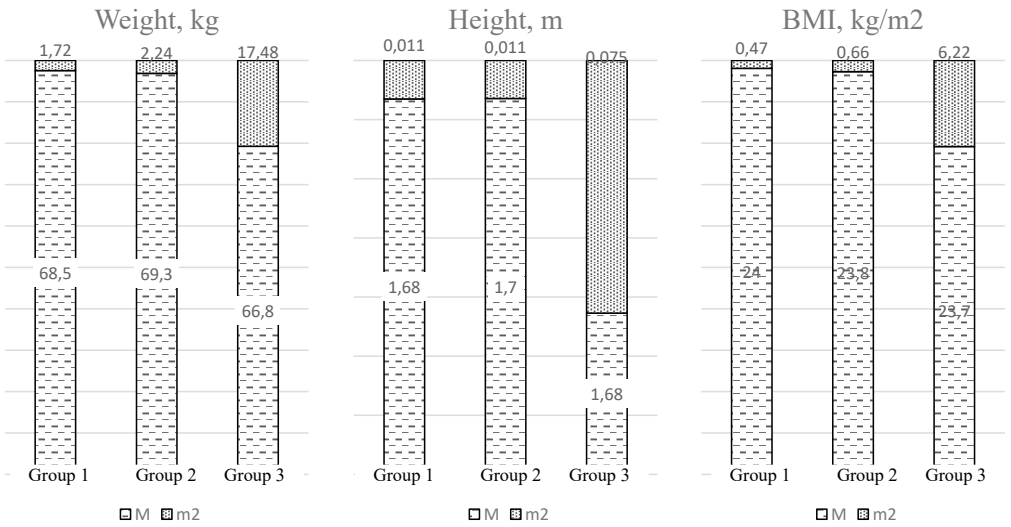

Fig. 1. Anthropometric indicators of the participants in studied groups

Significant differences between groups in behavioural risk factors were observed in the assessment of sleep and nutrition (**table 1**). Study participants who changed residence (groups 2 and 3) had worse quality (p=0.024) and less quantity (p=0.033) of sleep compared to participants in group 1, with the worst scores observed among people who moved abroad. A clear sleep pattern was more often observed in patients who at the time of the survey lived in their own homes (group 1), while sleep pattern violations were most common among patients who changed their place of residence within Ukraine (p=0.003). It can be assumed that the reason for the deterioration of sleep duration and quality is low adaptation to new living conditions and time zone (for group 3). A similar trend was also observed with deterioration of nutrition, namely, this state occurred least often among participants of group 1, and most often among participants of group 3 (p=0.037). That is, a higher risk of developing CVD due to sleep and eating disorders was observed in people who had to leave their homes even in comparison with participants in conditions of constant anxiety and regular shelling within Ukraine. Interestingly, there were no differences in the frequency of smoking, alcohol abuse, and intensity of physical activity. Though, the studies mentioned earlier revealed changes in these risk factors, frequency differences during wartime were studied only in comparison to peacetime. Given the fact that wartime and forced displacement are a significant stress for every person, it cannot be ruled out that the prevalence of CVD risk factors listed above has increased in our participants compared to peacetime. But there are currently no data in our study regarding this because the questionnaire of these patients was not conducted in full before the war.

Significant differences between groups were found in the participants' self-assessment regarding their living comfort, socialization, and work (**table 2**). In groups 2 and 3, there were almost no participants who were very satisfied with their living comfort, the least satisfied were the patients of group 2 (p=0.037), who were forced to change their place of residence within Ukraine, which probably contributed to a decrease in the quality of life of these respondents. It is worth noting that respondents from group 3 were the least involved in the social sphere, namely it was difficult for them to integrate into a new society (p=0.023), and it seemed to be the most obvious reason why the opportunity for self-expression was significantly limited in

this group (p=0.025). In addition, group 3 participants complained significantly more often about the lack of care from relatives (p=0.028). The participants of group 2 had a slightly better situation compared to group 3 – it was easier for them to socialize, and they more often noted the care of relatives. Language barriers and cultural differences are most likely the cause of such differences, but this assumption requires further research. A large proportion of participants in group 2 and 3, compared to group 1, lost their jobs (p=0.001) or were forced to change jobs (p=0.048), which probably negatively affected both the financial and social spheres of their life, and therefore overall quality of life. It is well-known that loneliness, isolation, lack of support from acquaintances, friends and relatives are risk factors for the development of many neurological and later physical disorders. Therefore, people who were forced to leave their usual social network (groups 2 and 3), and even more so – to go abroad (group 3), can be classified as at high risk of developing health disorders, especially in the psycho-emotional sphere.

Table 1

Frequency of behavioural risk factors among the participants in studied groups

Indicators	Group 1 (n=80)	Group 2 (n=49)	Group 3 (n=31)
The quality of sleep worsened			
1-yes	52 (65,0%)	37 (75,5%)	28 (90,3%)
2-no	28 (35,0%)	12 (24,5%)	3 (9,7%)
χ^2=7,495, p=0,024			
The amount of sleep decreased			
1-yes	46 (57,5%)	32 (65,3%)	26 (83,9%)
2-no	34 (42,5%)	17 (34,7%)	5 (16,1%)
χ^2=6,833, p=0,033			
Clear sleep pattern			
1-yes	32 (40,0%)	6 (12,2%)	8 (25,8%)
2-no	48 (60,0%)	43 (87,8%)	23 (74,2%)
χ^2=11,590, p=0,003			
Deterioration of nutrition			
1-yes	26 (32,5%)	18 (36,7%)	19 (61,3%)
2-no	54 (67,5%)	30 (61,2%)	12 (38,7%)
3-other	0 (0%)	1 (2,1%)	0 (0%)
χ^2=10,198, p=0,037			

Table 2

Frequency of stress factors among the participants in studied groups

Indicators	Group 1 (n=80)	Group 2 (n=49)	Group 3 (n=31)
1	2	3	4
Residential comfort, n			
1-very dissatisfied	2 (2,5%)	1 (2,0%)	0 (0%)
2-unsatisfied	4 (5,0%)	3 (6,0%)	1 (3,2%)
3-neutral attitude	18 (22,5%)	21 (42,8%)	11(35,5%)
4-satisfied	33 (41,3%)	20 (40,8%)	17 (54,8%)
5-very satisfied	23 (28,7%)	4 (8,2%)	2 (6,5%)
χ2=16,402, p=0,037			

Table 2 (Continued)

1	2	3	4
An opportunity to share thoughts, ideas			
1-complete absence	3 (3,7%)	2 (4,1%)	4 (12,9%)
2-quite significant absence	8 (10,0%)	5 (10,2%)	9 (29,0%)
3-digit absence	16 (20,0%)	14 (28,6%)	9 (29,0%)
4-is not quite full	32 (40,0%)	19 (38,8%)	5 (16,2%)
5-I have full	21 (26,3%)	9 (18,3)	4 (12,9%)
$\chi 2$=17,491, p=0,025			
Integration (in social circles, groups, associations)			
1- I can't at all	12 (15,0%)	8 (16,3%)	9 (29,1)
2- I almost can't	12 (15,0%)	14 (28,6%)	5 (16,1%)
3- I sometimes succeed	24 (30,0%)	17 (34,7%)	13 (41,9%)
4- I have a great opportunity	20 (25,0%)	9 (18,4%)	4 (12,9%)
5- I can always	12 (15,0%)	1 (2,0%)	0 (0%)
$\chi 2$=17,777, p=0,023			
Care of relatives			
1- my relatives cannot take care of me at all	1 (1,2%)	1 (2,0%)	1 (3,2%)
2- my relatives can hardly take care of me	5 (6,3%)	1 (2,0%)	4 (12,9%)
3- my relatives can take care of me sometimes	10 (12,5%)	11 (22,5%)	10 (32,3%)
4- my relatives have a great opportunity to take care of me	25 (31,3%)	22 (44,9%)	10 (32,3%)
5- my relatives always take care of me	39 (48,7%)	14 (28,6%)	6 (19,3%)
$\chi 2$=17,174, p=0,028			
Work			
1-available	51 (63,8%)	21 (42,8%)	13 (41,9%)
2-absent	29 (36,2%)	28 (57,2%)	18 (58,1%)
$\chi 2$=7,260, p=0,027			
Job was lost			
1-yes	8 (10,0%)	10 (20,4%)	14 (45,2%)
2-no	65 (81,3%)	34 (69,4%)	14 (45,2%)
3-other	7 (8,7%)	5 (10,2%)	3 (9,6%)
$\chi 2$=18,025, p=0,001			
Profession was changed			
1-yes	7 (8,7%)	10 (20,4%)	10 (32,3%)
2-no	68 (85,0%)	36 (73,5%)	19 (61,3%)
3-other	5 (6,3%)	3 (6,1%)	2 (6,4%)
$\chi 2$=9,583, p=0,048			

The characteristics of the influence of stress factors on the behavioural factors of CVR for group 1 are presented in **table. 3**. It was found that the impact of traumatic event experience on the disturbances of sleep (reduction in quality, disturbed duration or regimen) was the most common, namely, the examined were witnesses of artillery shelling (p=0.001 for the deterioration of sleep quality), saw the bodies of killed civilians (p=0.039 for sleep regimen), as a result of which, presumably, the feeling of safety on the street was lost, which also affected sleep disturbances (p=0.033 for the deterioration of sleep quality). Other causes of sleep disorders included financial resources (p=0.002 for worsening sleep quality and p=0.023 for waking up), change of residence in Ukraine (p=0.012 for reduced amount of sleep) and possible limitation

of the opportunity for socialization, which was observed in complaints about the impossibility of sharing one's thoughts, ideas (p=0.006 for waking up) and a feeling of one's insignificance, powerlessness (p=0.009 for sleep mode).

Table 3

Stress factors that influenced the appearance of behavioural risk factors in the studied participants who remained in their hometown

Behavioural risk factors	Identified influencing factors	p-value
Low quality and lack of sleep as a risk factor		
Decreased amount of sleep	I had to change my place of residence in Ukraine	0,012
The quality of sleep worsened	Financial resources	0,002
	Being a witness to the artillery shelling	0,001
	The total amount of traumatic exposure	0,0001
	Safety on the street	0,033
Awakening	Financial resources	0,023
	An opportunity to share thoughts, ideas	0,006
Sleep regimen	Feeling of insignificance, inability to do something, powerlessness	0,009
	In the last 6 months there were no changes at work or there was an improvement in working conditions, etc	0,035
	The total amount of traumatic exposure	0,039
	Witnessing civilians killed (not through mass media, that is, not via photos or videos)	0,039
Improper diet as a risk factor		
Nutritional deterioration	The feeling that you are doing useful things	0,022
	Profession changed in the last 6 months	0,043
	Safety at home	0,021
	Safety on the street	0,0001
Harmful habits as a risk factor		
Smoking	Friends/acquaintances taking care of you	0,016
	Being a witness to airstrikes	0,032
	Among your acquaintances/relatives/friends are those who died as a result of military operations (including those who were in service)	0,016
Increased frequency of smoking	Reduced wages/deteriorated working conditions in the last 6 months	0,010
Alcohol abuse	The need to make decisions about others (close relatives, friends who rely on your decision)	0,048
	Job loss in the last 6 months	0,008
Low intensity of physical activity as a risk factor		
Assessment of physical activity	The total amount of traumatic exposure	0,009
Decreased physical activity	Currently working	0,029

The nutrition deterioration in this group of examinees was influenced by the quality of life, which was characterized by a feeling of safety on the street (p=0.0001) and at home (p=0.021), by a change of profession (p=0.043), as well as the patients' sense of benefit from their actions (p=0.022). An increase in the frequency of smoking among the examinees who remained in their hometown was associated with work, namely with worsening conditions or payment (p=0.010). It was also observed that the prevalence of tobacco smoking was associated with the traumatic exposure experience, namely the interviewees had witnessed airstrikes (p=0.032) or had acquaintances killed as a result of military actions (p=0.016), as well as with concern of friends/acquaintances about the interviewees (p=0.016). It was found that the need to make decisions about others affected the prevalence of alcohol abuse (p=0.048). However, it is impossible to determine whether the responsibility for other people contributed to the nervous tension that the interviewees tried to get rid of by consuming alcohol, or, on the contrary, it contributed to the mobilization of human resources, which made it more resistant to stress. In addition, the prevalence of this bad habit was influenced by job loss (p=0.008). Interestingly, the presence of a job (but not its loss) was associated with a change in the intensity of physical activity during the previous 6 months (p=0.029), while the overall assessment of the level of physical activity at the time of the survey was associated with the number of cases of traumatic exposure (p=0.009).

The results of the assessment of the impact of stress factors on the behavioural risk factors in group 2 are shown in **table. 4**. Sleep disturbances among internally displaced participants were affected by wider range of factors in comparison with participants who remained in their hometown. The most common causes of various sleep disturbances were social factors, namely integration into society (p=0.016 for the deterioration of sleep quality and p=0.014 for the sleep pattern), the feeling of insignificance (p=0.008 for the decrease in the amount of sleep and p=0.002 for the sleep regimen) or, conversely, feeling of the usefulness of own actions (p=0.028 for sleep regimen), or caring from relatives/family (p=0.021 for sleep regimen). Some criteria of the quality of life, namely the feeling of safety on the street (p=0.029 for reduced amount of sleep and p=0.0001 for worsening sleep quality) and at home (p=0.003 for worsening sleep quality), residential comfort (p=0.045 for reduced amount of sleep and p=0.006 for worsening sleep quality), financial resources (p=0.003 for sleep mode) also appeared among the influencing factors. Experience of traumatic exposure, namely the experience of airstrikes (p=0.009 for sleep quality deterioration) and artillery shelling (p=0.034 for sleep quality deterioration) or being a witness of dead civilians (p=0.039 for sleep mode), as well as changes in the field of work: deterioration conditions or payment (p=0.003 for reduced sleep), job loss (p=0.029 for wake), and access to health care (p=0.007 for wake) and qualified consultation (p=0.006 for sleep) were other factors that affected sleep disturbances in this group of patients. Changes in nutrition were associated not with any specific type of factors, but with a number of various factors that characterized the quality of life, namely, housing comfort (p=0.0001) and the opportunity to do favorite activities (p=0.031), the number of traumatic cases (p=0.002), opportunity for self-expression (p=0.031). However, for the first time appeared among participants the association between weight loss on the one hand and integration into society (p=0.044), the fact of having deceased among acquaintances (p=0.039) on the other hand. Similar factors influenced the increase in the frequency of bad habits among this category of patients. In particular, the feeling of one's insignificance (p=0.033) or having deceased people among acquaintances (p=0.048) influenced the frequency of smoking, and the feeling of usefulness of one's actions influenced the frequency of alcohol abuse (p=0.033). In addition, job loss had an effect on increased smoking frequency (p=0.035), while availability of medical care had an effect on the prevalence of alcohol abuse (p=0.006). Changes in physical activity levels also

depended on changes associated with work, namely, a change in profession (p=0.018) and a deterioration in working conditions or payment (p=0.011). And the opportunity to engage in hobbies (p=0.045) influenced both the overall assessment of physical activity and changes in its intensity (p=0.008).

Table 4

Stress factors influencing the appearance of behavioural risk factors in the studied internally displaced participants

Behavioural risk factors	Identified influencing factors	p-value
1	2	3
Low quality and lack of sleep as a risk factor		
Decreased amount of sleep	Residential comfort	0,045
	Feeling of insignificance, inability to do something, powerlessness	0,008
	Reduced wages/deteriorated working conditions in the last 6 months	0,003
	Safety on the street	0,029
The quality of sleep worsened	Residential comfort	0,006
	Integration into a group, associations, social circles	0,016
	Being a witness to airstrikes	0,009
	Being a witness to the artillery shelling	0,034
	Safety at home	0,003
	Safety on the street	0,0001
Awakening	Job loss in the last 6 months	0,029
	Access to points of medical assistance and places of preventive measures	0,007
Sleep regimen	Financial resources	0,003
	Feeling that you are doing useful things	0,028
	Feeling of insignificance, inability to do something, powerlessness	0,002
	Integration into a group, associations, social circles	0,014
	Relatives/family care for you	0,021
	Witnessing civilians killed (not through mass media, that is, not via photos or videos)	0,039
	Possibility of obtaining a qualified consultation from health care specialists	0,006
Improper diet as a risk factor		
Nutritional deterioration	Residential comfort	0,0001
	An opportunity to share your thoughts, ideas	0,031
	Ability to do favorite things/hobbies in free time	0,031
	The total amount of traumatic exposure	0,002
Weight loss	Integration into a group, associations, social circles	0,044
	Among your acquaintances/relatives/friends are those who died as a result of military operations (including those who were in service)	0,039

Table 4 (Continued)

1	2	3
Harmful habits as a risk factor		
Smoking	Integration into a group, associations, social circles	0,030
	Relatives/family care for you	0,028
	Currently working	0,025
Increased frequency of smoking	Feeling of insignificance, inability to do something, powerlessness	0,033
	Job loss in the last 6 months	0,035
	Among your acquaintances/relatives/friends are those who died as a result of military operations (including those who were in service)	0,048
Alcohol abuse	Integration into a group, associations, social circles	0,035
	Access to points of medical assistance and places of preventive measures	0,006
Increased alcohol consumption	Feeling that you are doing useful things	0,033
Low intensity of physical activity as a risk factor		
Assessment of physical activity	Ability to do favorite things/hobbies in free time	0,045
Decreased physical activity	Ability to do favorite things/hobbies in free time	0,008
	Profession changed in the last 6 months	0,018
	Reduced wages/deteriorated working conditions in the last 6 months	0,011

Data on the impact of stress factors on behavioural risk factors for group 3 are shown in **table 5**. It is interesting that although poor socialization according to our results was the most common in this group, compared to others, it did not affect any of the studied behavioural factors. Based on the data available in the mass media about the organization of regular open meetings of Ukrainians abroad, it can be assumed that in the absence of integration into local society, participants actively interacted with other residents of Ukraine who had gone abroad. However, this assumption needs further verification. In addition, the limited opportunity for self-expression, which was also quite common among the respondents of this group, according to our results, only affected awakening ($p=0.0001$). Other factors affecting sleep included the presence of deceased people among acquaintances ($p=0.046$). Noticeable was the common effect of work-related changes on alcohol abuse, namely job loss ($p=0.020$ and $p=0.010$), change of occupation ($p=0.005$ and $p=0.001$) and deterioration in working conditions and payment ($p=0.015$ and $p=0.007$) were associated with prevalence and frequency of alcohol abuse, respectively. An increase in the frequency of smoking, on the contrary, was associated only with a traumatic experience, namely, the interviewees saw dead civilians ($p=0.046$). This traumatic experience was also associated with poorer nutrition ($p=0.046$). It is noteworthy that the prevalence of experience of airstrikes or artillery shelling among the participants from different groups was not significantly different, and these stressors did not affect any of the behavioural factors among participants in group 3. The feeling of usefulness of one's actions among respondents was associated with nutrition ($p=0.045$), and the feeling of insignificance – with the general assessment of physical activity ($p=0.002$) and changes in its intensity ($p=0.005$). It

can be assumed that the feeling of insignificance is one of the manifestations of the depressive syndrome, which in turn is characterized by hypoboulia, one of the symptoms of which is a decrease in physical activity.

Table 5

Stress factors that influenced the appearance of behavioural risk factors in the studied participants living abroad

Behavioural risk factors	Identified influencing factors	p-value
Low quality and lack of sleep as a risk factor		
The quality of sleep worsened	Among your acquaintances/relatives/friends are those who died as a result of military operations (including those who were in service)	0,046
Awakening	An opportunity to share your thoughts, ideas	0,0001
	Changing places of residence in Ukraine	0,004
Improper diet as a risk factor		
Nutritional deterioration	Witnessing civilians killed (not through mass media, that is, not via photos or videos)	0,030
Weight gain	Relatives/family care for you	0,022
Weight loss	Feeling that you are doing useful things	0,045
Harmful habits as a risk factor		
Increased frequency of smoking	Witnessing civilians killed (not through mass media, that is, not via photos or videos)	0,046
Alcohol abuse	Job loss in the last 6 months	0,020
	Profession changed in the last 6 months	0,005
	Reduced wages/deteriorated working conditions in the last 6 months	0,015
Increased alcohol consumption	Job loss in the last 6 months	0,010
	Profession changed in the last 6 months	0,001
	Reduced wages/deteriorated working conditions in the last 6 months	0,007
Low intensity of physical activity as a risk factor		
Assessment of physical activity	Feeling of insignificance, inability to do something, powerlessness	0,002
Decreased physical activity	Feeling of insignificance, inability to do something, powerlessness	0,005

4. Conclusions

1. Deterioration of the quality and regimen of sleep and nutrition is often observed among people who were forced to change their place of residence during the armed conflict. Therefore, in this category of the population, these behavioural factors must be included in the screening for the increased risk of developing cardiovascular diseases.

2. Loss or change of job and low socialization in new conditions are common stress factors among people who change their place of residence. Therefore, psychological support of

this population category is especially necessary to prevent the deterioration of a person's mental health.

3. In people who remain in their hometown, sleep disturbances can often be caused by traumatic influences, while changes in work and its conditions mainly affect the frequency of smoking, alcohol abuse, and poor nutrition. Therefore, people who have had a traumatic experience or experienced negative changes at work need special attention in order to detect health disorders as soon as possible.

4. In internally displaced people, socialization affects many different behavioural factors: sleep, nutrition, bad habits. Socialization in a new society affects health and is likely a factor of high cardiovascular risk. Traumatic experiences, quality of life, and changes in work are also important influencing factors in this category of people. Presumably, for internally displaced people, psychological support and assistance with their integration into society can be effective in order to correct behavioural risk factors.

5. Among people living abroad, only the job loss, change of profession, or the deterioration of working conditions or payment have a significant effect on the prevalence and frequency of alcohol abuse, while the increase in the frequency of smoking and eating disorders are associated with the fact of seeing dead bodies as a result of military actions. Only the presence of deceased people among acquaintances of the interviewees is associated with sleep deterioration. The level and intensity of physical activity completely depend on the respondent's sense of insignificance. Therefore, in people living abroad, psychological support to overcome the consequences of traumatic experiences and to increase self-esteem may have a positive effect on behavioural cardiovascular risk factors.

6. Therefore, in order to reduce the severity or eliminate behavioural risk factors, special attention should be paid to overcoming the consequences of traumatic experiences among people who remain in their hometown, to integrate internally displaced people into society, and to immediately provide psychological support to people living abroad.

References

1. Abolhassani, N., Santos-Eggimann, B., Büla, C., Goy, R., Guessous, I., & Henchoz, Y. (2019). Quality of life profile in three cohorts of community-dwelling Swiss older people. BMC geriatrics, 19(1), 96. https://doi.org/10.1186/s12877-019-1112-4

2. Al Ali, R., Rastam, S., Fouad, F. M., Mzayek, F., & Maziak, W. (2011). Modifiable cardiovascular risk factors among adults in Aleppo, Syria. International journal of public health, 56(6), 653–662. https://doi.org/10.1007/s00038-011-0278-0

3. Deguchi, Y., Iwasaki, S., Niki, A., Kadowaki, A., Hirota, T., Shirahama, Y., Nakamichi, Y., Okawa, Y., Uesaka, Y., & Inoue, K. (2022). Relationships between Occupational Stress, Change in Work Environment during the COVID-19 Pandemic, and Depressive and Anxiety Symptoms among Non-Healthcare Workers in Japan: A Cross-Sectional Study. International journal of environmental research and public health, 19(2), 983. https://doi.org/10.3390/ijerph19020983

4. Fadieienko, H.D. (Eds.). (2022). Neinfektsiini zakhvoriuvannia v period ta pislia zbroinykh konfliktiv [Non-communicable diseases during and after armed conflicts]. Kharkiv: TOV «Dim Reklamy» [in Ukrainian].

5. Jawad, M., Vamos, E. P., Najim, M., Roberts, B., & Millett, C. (2019). Impact of armed conflict on cardiovascular disease risk: a systematic review. Heart (British Cardiac Society), 105(18), 1388–1394. https://doi.org/10.1136/heartjnl-2018-314459

6. Krantz, D. S., Shank, L. M., & Goodie, J. L. (2022). Post-traumatic stress disorder (PTSD) as a systemic disorder: Pathways to cardiovascular disease. Health psychology : official journal of the Division of Health Psychology, American Psychological Association, 41(10), 651–662. https://doi.org/10.1037/hea0001127

7. Meng, L. B., Zhang, Y. M., Luo, Y., Gong, T., & Liu, D. P. (2021). Chronic Stress A Potential Suspect Zero of Atherosclerosis: A Systematic Review. Frontiers in cardiovascular medicine, 8, 738654. https://doi.org/10.3389/fcvm.2021.738654

8. Morina, N., Stam, K., Pollet, T. V., & Priebe, S. (2018). Prevalence of depression and post-traumatic stress disorder in adult civilian survivors of war who stay in war-afflicted regions. A systematic review and meta-analysis of epidemiological studies. Journal of affective disorders, 239, 328–338. https://doi.org/10.1016/j.jad.2018.07.027

9. O'Connor, D. B., Thayer, J. F., & Vedhara, K. (2021). Stress and Health: A Review of Psychobiological Processes. Annual review of psychology, 72, 663–688. https://doi.org/10.1146/annurev-psych-062520-122331

10. Osiichuk, M., & Shepotylo, O. (2020). Conflict and well-being of civilians: The case of the Russian-Ukrainian hybrid war. Economic Systems, 44(1), 100736. https://doi.org/10.1016/j.ecosys.2019.100736

11. Roberts, B., Makhashvili, N., & Javakhishvili, J. (2017). Hidden burdens of conflict: Issues of mental health and access to services among internally displaced persons in Ukraine. International Alert/GIP-Tbilisi/London School of Hygiene and Tropical Medicine.