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ASSESSMENT OF THE STRESS AND METABOLISM LEVELS BY USING ELECTRO-PHOTONIC EMISSION ANALYSIS METHOD IN UKRAINIAN MILITARY PERSONNEL AFTER FRONTLINE SERVICE

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This study aims to explore the potential of the Electrophotonic Emission Analysis (EPEA) method as an instrumental approach for studying stress in biomedical research. Specifically, the study focuses on assessing the stress levels of Ukrainian military personnel returning from the front using the EPEA method. Materials and methods: A total of 96 individuals participated in this open, non-randomized, exploratory, non-controlled, comparative study. Among them, 26 were military personnel, while the rest belonged to the comparison groups. The EPEA analysis was conducted using a certified hardware and software measuring device called Bio-Well 2.0 (United States). Results: The study found a significant decrease (p<0.0001) in energy levels, with both the military personnel group (41±4.25 J) and the functionally healthy individuals group (57.38±20.78 J) showing similar results. Among the participants, 62% of military personnel and 95% of patients with non-communicable diseases demonstrated optimal energy levels, while 38% and 5% respectively showed reductions. The stress levels measured were 3.69±0.62 cu for military personnel, 3.69±0.62 cu for functionally healthy individuals, and 3.99±1.17 cu for patients with non-communicable diseases. Conclusions: The EPEA method proved effective in instrumentally detecting increased levels of stress and anxiety in 96% of military personnel, 93% of functionally healthy individuals, and 87% of patients with non-communicable diseases in the study. It is of fundamental importance for scientific and systemic medicine to establish that changes in biophoton emission can be observed in patients with non-communicable diseases, including military personnel. Significant differences in total energy levels were found between patients and functionally healthy individuals, with EPEA results showing 41±4.25 J and 43.86±4.87 J respectively for patients and functionally healthy people (p<0.0001). Electro-photonic emission analysis is a promising, valid, accessible instrumental method for biomedical research.

Key words: biophoton emission, ultra-weak photon emission, electro-photonic emission analysis, stress, metabolism, non-communicable diseases.

The study is a fragment of the research project "Development of algorithms and technology for introducing a healthy lifestyle in patients with non-communicable diseases based on the study of functional status", state registration No. 0121U108237.

Introduction

We proceed to examine the factors associated with stress, which is widely recognized as a universal etiopathogenetic element capable of triggering, exacerbating, advancing, and decompensating internal organ diseases. It is an established fact that stress can precipitate mental disorders in individuals of all professions and age groups. Therefore, timely identification of individuals experiencing high levels of stress within professional teams remains crucial in preserving the mental, physical, and social well-being, as well as work capacity of employees. The issue of accurately assessing stress levels in individuals becomes even more pertinent during times of unforeseen circumstances, such as during periods of war, owing to the potential impact of extreme mental and physical stress on individuals. Thus, the identification and prevention of stress holds particular significance for individuals in strategically important professions, particularly among military personnel.

More than a decade ago, the assessment of stress levels relied primarily on testing individuals through various scales and questionnaires. This diagnostic approach was based on analyzing respondents' answers to the questions posed, and conclusions about stress levels, anxiety, etc., were drawn from the statistical processing of these answers [1]. However, these methods are not entirely objective since respondents can intentionally provide incorrect answers if desired. Furthermore, based on practical experience with military personnel, it has been observed that they often choose not to disclose their true emotional state. They may refuse to undergo testing and sometimes even request medical staff to complete the tests on their behalf. Consequently, there is no certainty that they will provide truthful responses during the testing process. To address these challenges, one approach is to measure stress levels using instrumental methods. It is widely recognized that stress triggers physiological reactions within the body, leading to objective metabolic and functional changes in tissues and organs. These objective changes accompany the stress response. By registering and evaluating these changes, we can objectively determine the stress level in an individual's body. This understanding has spurred scientific exploration into instrumental methods for objectively studying stress. The adoption of instrumental stress measurement methods holds the potential to address several diagnostic challenges and reduce subjectivity in examinations. To the best of our knowledge, no previous research has explored the possibility of utilizing such a device in the clinical medical prac-

tice of physicians.

Biophoton emission/Ultra-weak photon emission (UWPE) is a universal physiological phenomenon in all living beings, from single-celled [2] up to human [3]. Biophoton emission occurs as a result of cellular metabolism, characterized by an intensity of tens to thousands of photons per square centimetre per second in the near infrared [4]. The emission of biophotons as a new physiological parameter of living organisms has been extensively studied for the last decades. It is now understood that this phenomenon is not just a by-product of metabolic processes, but an information signal. For example, it has been found that in the neurons of the brain, signal propagation occurs in the form of electrical signals, chemical signals, and biophotons [5]. Thus, by assessing biophotons, the intensity of metabolic processes and the physiological response of a person can be investigated. Various methodological approaches to the registration of biophotons during their study were developed. From our point of view the method of Electro-Photonic Emission Analysis (EPEA) is one of the most promising for applying in biomedical research. A distinctive feature of this method is that the photon emission is registered after a short exposure to an electromagnetic pulse. The energy of the electromagnetic pulse is transferred to the biophotons of the surface of the skin of the respondent's fingers and potentiates them. This makes the effect of their enhanced short-term radiation. This optical phenomenon is recorded, processed and analyzed. More than 25 years of studying the nature of the obtained images has allowed the authors of the EPEA method to develop the principles of clinical interpretation and analysis. It also became possible, based on the analysis of electrophoton emission from the fingers of the respondents, to produce an objective physiological recording of the level of stress in patients [6, 7]. This opens up a new era of clinical possibilities for assessing stress levels, as it is a simple, convenient instrumental method that is valid. It makes it possible to avoid subjectivity and reduce the influence of the human factor in the study.

The purpose of the study was to assess the level of stress by applying EPEA method among the Ukrainian military personnel after frontline service.

Materials and methods

96 people were included in an open, non-randomized, exploratory, non-controlled, comparative study. This study was performed at the Centre for Biophotonics and Valeology of the Department of Internal Medicine and Emergency Medicine, Poltava State Medical University. 26 military personnel with non-communicable diseases (NCDs) made up group GM with a median age of 45 (26; 57) and 96% male representation. Of these, 24 individuals (92%) were transferred from the military hospital to the therapeutic department for the final stage of treatment, while 2 individuals (8%) received outpatient care. All participants had military experience and had served at the front. None of them had a history of injuries, but they were polymorbid, meaning they had multiple chronic conditions. Among the military personnel, 11 individuals (42%) had stage I-II hypertension, 26 (100%) had gastrointestinal diseases, and 5 (19%) had respiratory diseases.

The first comparison group (group GI) comprised 39 functionally healthy interns, with a median age of 23 (23; 26) and 7% male representation. These interns were surveyed during the war. It is important to note that there are no completely healthy individuals, so the concept of "functional health" in this context indicated the absence of complaints, acute illnesses, and exacerbation of chronic diseases at the time of the survey among the respondents.

The first comparison group (group GI) comprised 39 functionally healthy interns, with a median age of 23 (23; 26) and 7% male representation. These interns were surveyed during the war. It is important to note that there are no completely healthy individuals, so the concept of "functional health" in this context indicated the absence of complaints, acute illnesses, and exacerbation of chronic diseases at the time of the survey among the respondents. The second comparison group (group GP) consisted of patients with NCDs, specifically stage I-III hypertension with polymorbidity. The individuals of this group had a median age of 60 (32; 86) and 62% male representation. Similar to the military personnel, these patients were also examined during the ongoing war in Ukraine.

We performed an instrumental assessment of the level of stress for those patients who received the treatment at the clinical bases of the department. We did not have the possibility of additional randomization for nosological diagnoses and this was a limitation of this study.

The assessment of the stress level by the EPEA method was performed on a hardware-software certified measuring device Bio-Well 2.0 (United States). All study participants underwent a full scan in the alternate photoregistration mode with the Bio-Well device of ten fingers: thumb left (1L), index left (2L), middle left (3L), ring left (4L), little left (5L), thumb right (1R), index right (2R), middle right (3R), ring right (4R), little right (5R). To do this, each finger was placed in turn in the measuring chamber of the device. The principle of operation of the device is shown in fig. 1.

After registration, the obtained images were processed and digitized in an automated mode. Clinical interpretation of findings was performed automatically. We evaluated four main parameters: glow area, glow intensity, glow energy, stress level.

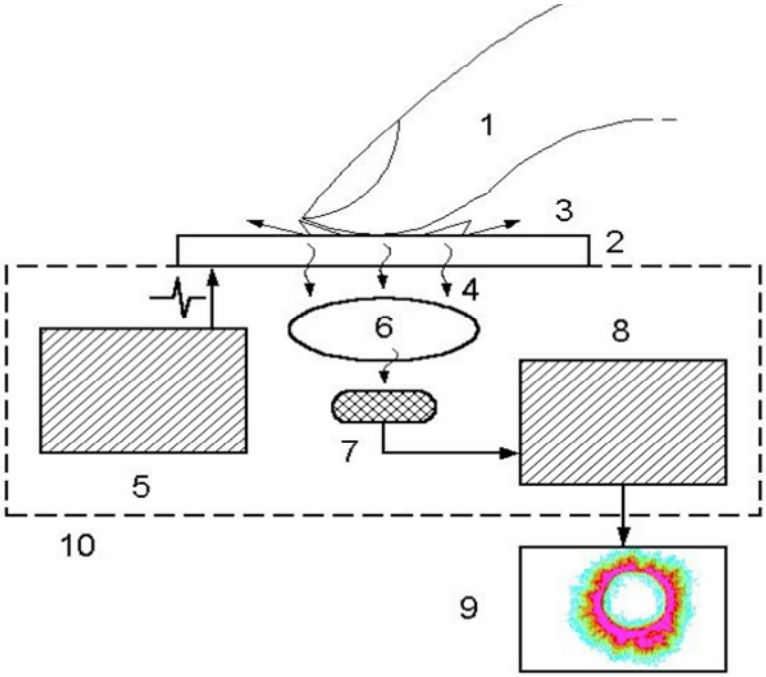

Fig.1. The operating principle of device for AEPE /GRV-camera. 1 - object of study; 2 - transparent electrode; 3 − gas discharge; 4 - optical radiation; 5 - generator; 6 - optical system; 7, 8 - video converter; 9 - computer; 10 - instrument case [6, 7].

A greater number of photons are released in the ionizing air gap at a high level of metabolism. They have higher intensity and energy with a high metabolic rate as well. Therefore, the glow area (S) is the first recorded parameter, which is the number of light quanta generated by the object, in computer units - pixels (the number of pixels in the image having brightness above the threshold). Intensity is the second recorded parameter that reflects the level of the subject's quantum activity based on an estimate of the intensity spectrum for a particular emission image. Glow energy (E) is the third recorded parameter, which is calculated by the formula:

$E (J) = S*I*4*10^{-8}$,

where S is the glow area, I is the amplitude of the signal.

The scale of clinical interpretation of the E was as follows: E – 0-20 J – it is low level, 20-40 J – it is low level, 40–70 J – it is optimal level, 70–90 J – it is increased level, 90–100 J – it is high level.

The stress causes reactions of the autonomic nervous system. Changes in metabolic processes are a consequence of this. And this is manifested at the tissue level in a change in the area and contour of the emission glow. Therefore, the stress is calculated by the formula:

$stress=sumR+sumL+|sumR-sumL|$,

where sumR - is the amount of variability of all the areas of the right finger; sumL – is the amount of variability of the total area of the left fingers. These amounts change from zero to one. One is taken as 100 %. And if stress > 10 then it is equal to 10. Greater variability indicates more stress. On this basis, the authors of the methodology developed a scale of clinical interpretation: the scale of clinical interpretation: 0–2 c.u. – it is calm state, 2–3 c.u. – it is optimal condition, 3–4 c.u. – it is anxiety, 4–6 c.u. – it is average condition, 6–8 c.u. – it is increased stress levels, 8–10 c.u. – it is distress [6, 7].

Evaluation of these parameters from each finger displays local metabolic processes. The total score from all fingers characterizes the functional state of the organism as a whole. The stress level is calculated from the total score of the parameters.

The study was approved by the Ethics Committee. All applicable ethical rules have been observed. Statistical analysis was performed using the Prism 5.0 software package. The data obtained are presented as mean values with their mean error (M±m). Mann-Whitney U-test was used to compare and determine the statistical significance of differences between groups. The differences were considered significant at $p<0.05$.

Results and discussion

The findings indicate that at the organism level, the energy processes in military personnel differed from those of functionally healthy individuals and were similar to the results observed in patients with NCDs. The analysis of energy levels demonstrated that a significant decrease ($p<0.0001$) in energy (E) was observed in group GM (41±4.25 J) compared to group GI (57.38±20.78 J). There was no significant difference in E scores between the GM and GP groups, with E measured at (43.86±4.87 J) in NCDs patients. The data reveals that 16 (62%) of the military personnel had an optimal energy level, while 10 (38%) had a low energy level. Among the patients with NCDs, 37 (95%) had optimal energy levels, and 2 (5%) had low energy levels. In the GI group, there was no energy deficit in the tissues,

with 37 (90%) functionally healthy individuals having an optimal energy level and 4 (10%) having a high energy level. Comparative analysis of emission processes for each finger showed that the indicators in group GM did not significantly differ from group GI but significantly differed from group GP (Table).

Table 1

Comparative characteristics of the physical and mathematical parameters of EPEA in study groups

P	Area			Intensity			Energy		
F	Group GM	Group GI	Group GP	Group GM	Group GI	Group GP	Group GM	Group GI	Group GP
1L	10360±1538	11323±3099	11487±1974	87.73±7.601	88.57±12.16	95.96±7.426	3.942±0.7945	4.482±2.085	4.813±1.28
	p_1=0.1342, p_2<0.0001			p_1<0.0001, p_2<0.0001			p_1=0.4757, p_2<0.0001		
2L	10060±1222	10473±2595	10951±1895	93.98±10.23	93.04±11.47	98.32±7.511	4.118±1.002	4.322±1.792	4.707±1.333
	p_1=0.8688, p_2=0,0024			p_1=0,2032, p_2<0,0001			p_1=0,7637, p_2<0,0001		
3L	9899±1169	10778±2855	11117±2059	91.35±4.505	93.58±11.88	98.38±6,65	3.913±0.5834	4.499±1.985	4.781±1.367
	p_1=0.1683, p_2=0.0001			p_1=0,9252, p_2<0,0001			p_1=0,3254, p_2<0,0001		
4L	9667±960.8	10621±3021	10905±1913	92.87±4.953	96.41±11.87	99.94±6.933	3.883±±0.5203	4.572±2.121	4.762±1.312
	p_1=0.2197, p_2<0.0001			p_1=0.3578, p_2<0.0001			p_1=0.2585, p_2<0.0001		
5L	9982±1304	10793±3313	10883±1793	95.44±5,217	98.07±12.68	102.2±7.682	485.6±2.497	4.723±2.228	4.857±1.287
	p_1=0,6203, p_2=0,0031			p_1=0,9103, p_2<0,0001			p_1=0,5556, p_2<0,0001		
1R	10150±1509	11114±3489	11566±2077	86.38±9.065	87.54±13.44	94.78±7.27	3.816±0.8479	4.396±2.311	4.79±1.317
	p_1=0.5113, p_2=0.0005			p_1=0.8131, p_2=0.0001			p_1=0.7186, p_2<0.0001		
2R	9631±1155	10713±3451	10995±1955	92.76±6.197	93.65±12.19	98.35±7.441	3.865±0.6072	4.511±2.307	4.722±1.313
	p_1=0,3578, p_2<0.0001			p_1=0.3558, p_2<0.0001			p_1=0.7554, p_2<0.0001		
3R	9919±1260	10695±3205	11059±1915	92.64±5.178	93.56±12.23	98.58±6.906	3.978±0.6305	4.488±2.193	4.762±1.248
	p_1=0.8777, p_2=0,0011			p_1=0.257, p_2<0.0001			p_1=0.7214, p_2<0.0001		
4R	9936±989	10646± 3024	11003±1863	94.49±4.754	96.48±12.25	99.76±6.925	4.057±0.5017	4.581±2.09	4.796±1.276
	p_1=0,9193, p_2=0,0002			p_1=0.744, p_2<0.0001			p_1=0.982, p_2<0.0001		
5R	9652±821.5	10422±2649	10828±1967	95.12±4.766	98.77±12.45	101.5±7.164	3.962±0.3931	4.584± 1.965	4.802±1.344
	p_1=0.4827, p_2<0.0001			p_1=0.2371, p_2<0.0001			p_1=0.3716, p_2<0.0001		

Note: P is short forms of the Parameter; F is short forms of the Finger;

p_1 – the difference Mann-Whitney test between the characteristics of the GM and GI groups;

p_2 – the difference Mann-Whitney test between the characteristics of the GM and GP groups.

This can be explained by the fact that the military personnel are young people and they do not have such pronounced metabolic disorders as patients with NCDs. The military personnel had polymorbid pathology of the internal organs, but it was of mild severity, was at the stage of an uncomplicated NCDs continuum and did not have time to form gross metabolic changes in their tissues. Therefore, indicators of the glow area, glow intensity, glow energy did not have significant differences from functionally healthy young people of the group GI. The results of the present study demonstrate that, that patients with NCDs are characterized by metabolic changes at the tissue level. These changes are manifested by a significant statistical difference from the indicators of functionally healthy people. Thus, these results confirmed the results of our previous studies [8, 9].

The device automatically calculated the level of stress based on the variability of baseline indicators and the tortuosity of the border of the glow contours in the photographs of each finger of both hands, and such results were obtained (Figure 1).

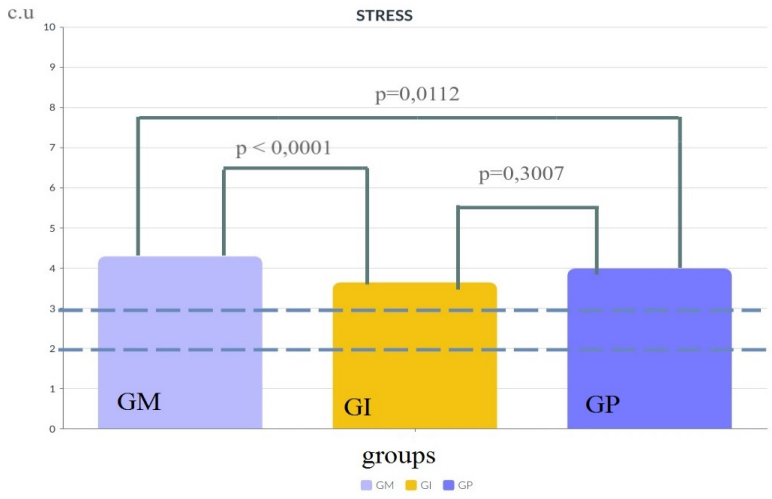

Figure 1. The stress levels by EPEA method in study groups. Note: the boundaries of the optimal level are shown by a dotted line.

Group analysis of the stress level indicator did not establish a significant difference between groups GI (3.69±0.62 c.u.) and GP (3.99±1.17 c.u.). The military personnel had the highest stress level - GM (3.69±0.62 c.u.), which significantly differed from the comparison groups (Figure 1).

During the individual analysis, it was established that during the war, the level of stress was increased in the majority of subjects in the comparison groups. The number of people with elevated levels of stress was as: 96 % (25/26) were in the GM group, 93 % (38/39) were in the GP group, 87 % (34/41) were in the GM group. 81 % (21/26) of military personnel had an average condition of stress and 4 % (15/26) of military personnel had an anxiety. 4 % (1/26) man had optimal condition in group GM. The level of anxiety was in 72 % (30/39) of patients with NCDs, the average level of stress was in 21 % (8/39) of patients with NCDs, the high level of stress was in 2 % (1/39) of patients with NCDs. The optimal level of stress in group GI was in 11 % (4/41) of respondents, the level of anxiety was in 51 % (20/41) of respondents, the average level of stress was in 36% (14/41) of respondents.

It is important to emphasize that the results of this study presented another possible way to study the level of stress, which is devoid of subjectivity. On the one hand EPEA is a simple, accessible, valid method that can be used without limitation in clinical medical practice and in biomedical research. On the other hand, provides a non-invasive study of mitochondrial function and metabolism at the tissue level in the living human body. Today it is believed that it is mitochondria that generate the majority of biophotons. It has been established that mitochondrial dysfunction is one of the universal mechanisms for the onset and progression of NCDs. The use of the EPEA method may open up new possibilities in the study of these issues [10, 11].

Conclusion

The EPEA method successfully detects an increased level of stress and anxiety in 96% of military personnel, 93% of functionally healthy individuals, and 87% of patients with NCDs who participated in the study.

It is of significant importance for fundamental science and systemic medicine to establish that changes in biophoton emission can be observed in patients with NCDs, including military personnel. The study revealed significant differences in total energy levels between patients and functionally healthy individuals, with EPEA results showing 41±4.25 J and 43.86±4.87 J, respectively, for patients, while functionally healthy individuals had a higher energy level of 57.38±20.78 J ($p<0.0001$).

EPEA is a promising, valid, accessible instrumental method for biomedical research.

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Реферат

ВИЗНАЧЕННЯ РІВНІВ СТРЕСУ І МЕТАБОЛІЗМУ МЕТОДОМ АНАЛІЗУ ЕЛЕКТРО-ФОТОННОЇ ЕМІСІЇ В УКРАЇНСЬКИХ ВІЙСЬКОВИХ, ЯКІ ПОВЕРНУЛИСЯ З ФРОНТУ: ПЕРШЕ ПОВІДОМЛЕННЯ

Невойт Г.В., Корпан А.С., Настрога Т.В., Кітура О.Є., Соколюк Н.Л., Люлька Н.О., Потяженко М.М.

Ключові слова: емісія біофотонів, надслабка емісія фотонів, аналіз електрофотонної емісії, стрес, метаболізм, неінфекційні захворювання.

Дане дослідження посвячено питанню інструментального дослідження стресу методом аналізу електрофотонної емісії, який представляється авторами як перспективний для використання у біомедичних дослідженнях. Метою дослідження було оцінити рівень стресу методом аналізу електрофотонної емісії у українських військовослужбовців, які повернулися з фронту. 96 осіб були включені у відкрите, нерандомізоване, пошукове, неконтрольоване, порівняльне дослідження, з яких 26 були воєнні, інші – групи порівняння. Аналіз електрофотонної емісії здійснювався на апаратно-програмному сертифікованому вимірювальному приладі Bio-Well 2.0 (США). Встановлено зниження ($p_1<0,0001$) енергії у групі військовослужбовців (41±4,25 Дж) порівняно з групою функціонально здорових осіб (57,38±20,78 Дж). 62 % військовослужбовців та 95% хворих на неінфекційні захворювання мали оптимальний рівень енергії, 38% та 5 % - знижений. 95 % хворих на неінфекційні захворювання мали оп-

тимальний. Рівень стресу у військовослужбовців становив 3.69±0.62 умовних одиниць, у функціонально здорових - 3.69±0.62 умовних одиниць, у хворих на неінфекційні захворювання - 3.99±1.17 умовних одиниць. Висновки. 1) Метод аналізу електро-фотонної емісії дозволив інструментально виявити підвищений рівень стресу та тривожність у 96% військовослужбовців, 93% функціонально здорових осіб, у 87% хворих на неінфекційні захворювання, які брали участь у дослідженні. 2) Принципове значення для фундаментальної науки та системної медицини має встановлення факту, що у пацієнтів із неінфекційними захворюваннями, у тому числі й військовослужбовців, реєструються зміни емісії біофотонів та є достовірні відмінності рівня загальної енергії порівняно із функціонально здоровими особами за результатами аналізу електро-фотонної емісії: 41±4,25 Дж та 43,86±4,87 Дж – у хворих та 57,38±20,78 Дж – у функціонально здорових ($p<0.0001$). 3) Аналіз електро-фотонної емісії є перспективним, валідним, доступним інструментальним методом для біомедичних досліджень.

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ОСОБЛИВОСТІ ОСОБИСТІСНОЇ ХАРАКТЕРИСТИКИ ОСІБ, ЩО ДОГЛЯДАЮТЬ ЗА ПАЦІЄНТАМИ З ДЕМЕНЦІЄЮ

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Деменція супроводжується зниженням пам'яті, порушенням мислення, поведінки та здатності виконувати щоденні функції, що вражає здебільшого осіб літнього віку і є однією з основних причин інвалідності. У всьому світі зростає кількість людей з деменцією і прогнози, як правило, свідчать про значне збільшення загальної поширеності, пов'язаної із старінням населення. Велика кількість пацієнтів з деменцією перебувають вдома, де функцію догляду за ними виконують рідні. Вони мають потенційний ризик навантаження, психологічний стрес, зумовлений змінами у психологічному стані пацієнтів з деменцією. Щоденна опіка вимагає максимального залучення особистісних адаптаційних процесів доглядачів і активізації психосоціального ресурсу в цілому. Метою даного дослідження було визначення особливостей акцентуацій характеру доглядачів за пацієнтами з деменцією. Встановлено, що майже за 80% хворих на деменцію доглядають їхні родичі. Ми проводили соціодемографічне, клініко-психопатологічне, психодіагностичне та статистичне обстеження. Методика K. Leongard - H. Schmieschek, (1970) дозволила нам встановити профіль особистісної акцентуації досліджуваних груп, який враховував наявність певного виду на рівні ознаки, тенденції чи явно присутньої характеристики. У осіб I групи, що мали навички догляду за пацієнтами констатовано статистично достовірне переважання тривожного ($\chi2=10,759$ $p=0,002$) та застрягаючого ($\chi2=4,166$, $p=0,042$) типу акцентуації, ніж у осіб I групи. І навпаки, у піклувальників з групи II переважав демонстративний ($\chi2= 8,028$, $p=0,005$). У ході дослідження особам, що виконують функцію догляду за пацієнтами з деменцією встановлено характерологічні профілі з вираженими акцентуаціями. Це дає змогу враховувати особливості особистісних характеристик при розробці психокорекційних заходів для доглядачів. Для даної категорії людей рекомендовано використовувати консультативну допомогу, психоосвітні заходи спрямовані на усвідомлення покращення якості життя.

Ключові слова: доглядачі, деменція, піклувальники, акцентуація, характерологічний профіль.

Зв'язок публікації з плановими науково-дослідними роботами. Стаття є фрагментом науково-дослідної теми «Клініко-психопатологічні та параклінічні дослідження і оптимізація лікувально-реабілітаційних заходів при основних формах психічної патології та коморбідних розладах» (№ державної реєстрації 0121U108235).

Деменція – це синдром, проявом якого є зниження пам'яті, порушення мислення та здатності виконувати щоденні функції [1]. Глибокий вплив вона має не тільки на пацієнтів, їхні родини та осіб, які здійснюють догляд, а й на суспільство в цілому [2].

Актуальність проблеми полягає в тому, що більше ніж за 80% пацієнтів на деменцію доглядають їхні родичі. Враховуючи прогнозовані тенденції старіння та зростання населення, очікується, що кількість людей з деменцією збільшиться [3]. Крім того, з'явилися переконливі докази, що підтверджують важливість потенційно модифікованих факторів ризику розвитку даного захворювання [4]. В Україні на нього страждають близько 63 тисяч людей, та щороку ця тенденція зростає.

У загальнонауковому уявленні, діагностика є розпізнавання стану системи або об'єкта за рахунок фіксації існуючих параметрів або показників і віднесення до відповідної діагностичної категорії [5]. Індивідуальний підхід до людини є особливо важливим при розробці способів інтерпретації результатів психологічного обстеження, що є актуальним і для осіб, що виконують функцію догляду за пацієнтами з деменцію [6].

У дослідження було включено 104 пари сімейних доглядачів та їх пацієнтів з деменцією. Критеріями включення сімейних доглядачів були: інформована згода доглядача, згідно рекомендацій ВОЗ - вік доглядачів від 25 років і ста-