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ЕЖЕМЕСЯЧНЫЙ НАУЧНЫЙ ЖУРНАЛ

Медицинские новости Грузии
საქართველოს სამედიცინო სიახლენი

GEORGIAN MEDICAL NEWS

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GMN: Georgian Medical News is peer-reviewed, published monthly journal committed to promoting the science and art of medicine and the betterment of public health, published by the GMN Editorial Board since 1994. GMN carries original scientific articles on medicine, biology and pharmacy, which are of experimental, theoretical and practical character; publishes original research, reviews, commentaries, editorials, essays, medical news, and correspondence in English and Russian.

GMN is indexed in MEDLINE, SCOPUS, PubMed and VINITI Russian Academy of Sciences. The full text content is available through EBSCO databases.

GMN: Медицинские новости Грузии - ежемесячный рецензируемый научный журнал, издаётся Редакционной коллегией с 1994 года на русском и английском языках в целях поддержки медицинской науки и улучшения здравоохранения. В журнале публикуются оригинальные научные статьи в области медицины, биологии и фармации, статьи обзорного характера, научные сообщения, новости медицины и здравоохранения. Журнал индексируется в MEDLINE, отражён в базе данных SCOPUS, PubMed и ВИНТИ РАН. Полнотекстовые статьи журнала доступны через БД EBSCO.

GMN: Georgian Medical News – საქართველოს სამედიცინო სიახლენი – არის ყოველთვიური სამეცნიერო სამედიცინო რეცენზირებადი ჟურნალი, გამოიცემა 1994 წლიდან, წარმოადგენს სარედაქციო კოლეგიისა და აშშ-ის მეცნიერების, განათლების, ინდუსტრიის, ხელოვნებისა და ბუნებისმეტყველების საერთაშორისო აკადემიის ერთობლივ გამოცემას. GMN-ში რუსულ და ინგლისურ ენებზე ქვეყნდება ექსპერიმენტული, თეორიული და პრაქტიკული ხასიათის ორიგინალური სამეცნიერო სტატიები მედიცინის, ბიოლოგიისა და ფარმაციის სფეროში, მიმოხილვითი ხასიათის სტატიები.

ჟურნალი ინდექსირებულია MEDLINE-ის საერთაშორისო სისტემაში, ასახულია SCOPUS-ის, PubMed-ის და ВИНТИ РАН-ის მონაცემთა ბაზებში. სტატიების სრული ტექსტი ხელმისაწვდომია EBSCO-ს მონაცემთა ბაზებიდან.

WEBSITE

www.geomednews.com

К СВЕДЕНИЮ АВТОРОВ!

При направлении статьи в редакцию необходимо соблюдать следующие правила:

1. Статья должна быть представлена в двух экземплярах, на русском или английском языках, напечатанная через **полтора интервала на одной стороне стандартного листа с шириной левого поля в три сантиметра**. Используемый компьютерный шрифт для текста на русском и английском языках - **Times New Roman (Кириллица)**, для текста на грузинском языке следует использовать **AcadNusx**. Размер шрифта - **12**. К рукописи, напечатанной на компьютере, должен быть приложен CD со статьей.

2. Размер статьи должен быть не менее десяти и не более двадцати страниц машинописи, включая указатель литературы и резюме на английском, русском и грузинском языках.

3. В статье должны быть освещены актуальность данного материала, методы и результаты исследования и их обсуждение.

При представлении в печать научных экспериментальных работ авторы должны указывать вид и количество экспериментальных животных, применявшиеся методы обезболивания и усыпления (в ходе острых опытов).

4. К статье должны быть приложены краткое (на полстраницы) резюме на английском, русском и грузинском языках (включающее следующие разделы: цель исследования, материал и методы, результаты и заключение) и список ключевых слов (key words).

5. Таблицы необходимо представлять в печатной форме. Фотокопии не принимаются. **Все цифровые, итоговые и процентные данные в таблицах должны соответствовать таковым в тексте статьи**. Таблицы и графики должны быть озаглавлены.

6. Фотографии должны быть контрастными, фотокопии с рентгенограмм - в позитивном изображении. Рисунки, чертежи и диаграммы следует озаглавить, пронумеровать и вставить в соответствующее место текста **в tiff формате**.

В подписях к микрофотографиям следует указывать степень увеличения через окуляр или объектив и метод окраски или импрегнации срезов.

7. Фамилии отечественных авторов приводятся в оригинальной транскрипции.

8. При оформлении и направлении статей в журнал МНГ просим авторов соблюдать правила, изложенные в «Единых требованиях к рукописям, представляемым в биомедицинские журналы», принятых Международным комитетом редакторов медицинских журналов - <http://www.spinesurgery.ru/files/publish.pdf> и http://www.nlm.nih.gov/bsd/uniform_requirements.html В конце каждой оригинальной статьи приводится библиографический список. В список литературы включаются все материалы, на которые имеются ссылки в тексте. Список составляется в алфавитном порядке и нумеруется. Литературный источник приводится на языке оригинала. В списке литературы сначала приводятся работы, написанные знаками грузинского алфавита, затем кириллицей и латиницей. Ссылки на цитируемые работы в тексте статьи даются в квадратных скобках в виде номера, соответствующего номеру данной работы в списке литературы. Большинство цитированных источников должны быть за последние 5-7 лет.

9. Для получения права на публикацию статья должна иметь от руководителя работы или учреждения визу и сопроводительное отношение, написанные или напечатанные на бланке и заверенные подписью и печатью.

10. В конце статьи должны быть подписи всех авторов, полностью приведены их фамилии, имена и отчества, указаны служебный и домашний номера телефонов и адреса или иные координаты. Количество авторов (соавторов) не должно превышать пяти человек.

11. Редакция оставляет за собой право сокращать и исправлять статьи. Корректур авторам не высылаются, вся работа и сверка проводится по авторскому оригиналу.

12. Недопустимо направление в редакцию работ, представленных к печати в иных издательствах или опубликованных в других изданиях.

При нарушении указанных правил статьи не рассматриваются.

REQUIREMENTS

Please note, materials submitted to the Editorial Office Staff are supposed to meet the following requirements:

1. Articles must be provided with a double copy, in English or Russian languages and typed or computer-printed on a single side of standard typing paper, with the left margin of 3 centimeters width, and 1.5 spacing between the lines, typeface - **Times New Roman (Cyrillic)**, print size - 12 (referring to Georgian and Russian materials). With computer-printed texts please enclose a CD carrying the same file titled with Latin symbols.

2. Size of the article, including index and resume in English, Russian and Georgian languages must be at least 10 pages and not exceed the limit of 20 pages of typed or computer-printed text.

3. Submitted material must include a coverage of a topical subject, research methods, results, and review.

Authors of the scientific-research works must indicate the number of experimental biological species drawn in, list the employed methods of anesthetization and soporific means used during acute tests.

4. Articles must have a short (half page) abstract in English, Russian and Georgian (including the following sections: aim of study, material and methods, results and conclusions) and a list of key words.

5. Tables must be presented in an original typed or computer-printed form, instead of a photocopied version. **Numbers, totals, percentile data on the tables must coincide with those in the texts of the articles.** Tables and graphs must be headed.

6. Photographs are required to be contrasted and must be submitted with doubles. Please number each photograph with a pencil on its back, indicate author's name, title of the article (short version), and mark out its top and bottom parts. Drawings must be accurate, drafts and diagrams drawn in Indian ink (or black ink). Photocopies of the X-ray photographs must be presented in a positive image in **tiff format**.

Accurately numbered subtitles for each illustration must be listed on a separate sheet of paper. In the subtitles for the microphotographs please indicate the ocular and objective lens magnification power, method of coloring or impregnation of the microscopic sections (preparations).

7. Please indicate last names, first and middle initials of the native authors, present names and initials of the foreign authors in the transcription of the original language, enclose in parenthesis corresponding number under which the author is listed in the reference materials.

8. Please follow guidance offered to authors by The International Committee of Medical Journal Editors guidance in its Uniform Requirements for Manuscripts Submitted to Biomedical Journals publication available online at: http://www.nlm.nih.gov/bsd/uniform_requirements.html
http://www.icmje.org/urm_full.pdf

In GMN style for each work cited in the text, a bibliographic reference is given, and this is located at the end of the article under the title "References". All references cited in the text must be listed. The list of references should be arranged alphabetically and then numbered. References are numbered in the text [numbers in square brackets] and in the reference list and numbers are repeated throughout the text as needed. The bibliographic description is given in the language of publication (citations in Georgian script are followed by Cyrillic and Latin).

9. To obtain the rights of publication articles must be accompanied by a visa from the project instructor or the establishment, where the work has been performed, and a reference letter, both written or typed on a special signed form, certified by a stamp or a seal.

10. Articles must be signed by all of the authors at the end, and they must be provided with a list of full names, office and home phone numbers and addresses or other non-office locations where the authors could be reached. The number of the authors (co-authors) must not exceed the limit of 5 people.

11. Editorial Staff reserves the rights to cut down in size and correct the articles. Proof-sheets are not sent out to the authors. The entire editorial and collation work is performed according to the author's original text.

12. Sending in the works that have already been assigned to the press by other Editorial Staffs or have been printed by other publishers is not permissible.

**Articles that Fail to Meet the Aforementioned
Requirements are not Assigned to be Reviewed.**

ავტორთა საქურაღებოლ!

რედაქციაში სტატიის წარმოდგენისას საჭიროა დაიცვათ შემდეგი წესები:

1. სტატია უნდა წარმოადგინოთ 2 ცალად, რუსულ ან ინგლისურ ენებზე დაბეჭდილი სტანდარტული ფურცლის 1 გვერდზე, 3 სმ სიგანის მარცხენა ველისა და სტრიქონებს შორის 1,5 ინტერვალის დაცვით. გამოყენებული კომპიუტერული შრიფტი რუსულ და ინგლისურენოვან ტექსტებში - **Times New Roman (Кириллица)**, ხოლო ქართულენოვან ტექსტში საჭიროა გამოვიყენოთ **AcadNusx**. შრიფტის ზომა – 12. სტატიას თან უნდა ახლდეს CD სტატიით.

2. სტატიის მოცულობა არ უნდა შეადგენდეს 10 გვერდზე ნაკლებს და 20 გვერდზე მეტს ლიტერატურის სიის და რეზიუმეების (ინგლისურ, რუსულ და ქართულ ენებზე) ჩათვლით.

3. სტატიაში საჭიროა გაშუქდეს: საკითხის აქტუალობა; კვლევის მიზანი; საკვლევი მასალა და გამოყენებული მეთოდები; მიღებული შედეგები და მათი განსჯა. ექსპერიმენტული ხასიათის სტატიების წარმოდგენისას ავტორებმა უნდა მიუთითონ საექსპერიმენტო ცხოველების სახეობა და რაოდენობა; გაუტკივარებისა და დაძინების მეთოდები (მწვავე ცდების პირობებში).

4. სტატიას თან უნდა ახლდეს რეზიუმე ინგლისურ, რუსულ და ქართულ ენებზე არანაკლებ ნახევარი გვერდის მოცულობისა (სათაურის, ავტორების, დაწესებულების მითითებით და უნდა შეიცავდეს შემდეგ განყოფილებებს: მიზანი, მასალა და მეთოდები, შედეგები და დასკვნები; ტექსტუალური ნაწილი არ უნდა იყოს 15 სტრიქონზე ნაკლები) და საკვანძო სიტყვების ჩამონათვალი (key words).

5. ცხრილები საჭიროა წარმოადგინოთ ნაბეჭდი სახით. ყველა ციფრული, შემაჯამებელი და პროცენტული მონაცემები უნდა შეესაბამებოდეს ტექსტში მოყვანილს.

6. ფოტოსურათები უნდა იყოს კონტრასტული; სურათები, ნახაზები, დიაგრამები - დასათაურებული, დანომრილი და სათანადო ადგილას ჩასმული. რენტგენოგრამების ფოტოასლები წარმოადგინეთ პოზიტიური გამოსახულებით **tiff** ფორმატში. მიკროფოტოსურათების წარწერებში საჭიროა მიუთითოთ ოკულარის ან ობიექტივის საშუალებით გადიდების ხარისხი, ანათალების შედეგის ან იმპრეგნაციის მეთოდი და აღნიშნოთ სურათის ზედა და ქვედა ნაწილები.

7. სამამულო ავტორების გვარები სტატიაში აღინიშნება ინიციალების თანდართვით, უცხოურისა – უცხოური ტრანსკრიპციით.

8. სტატიას თან უნდა ახლდეს ავტორის მიერ გამოყენებული სამამულო და უცხოური შრომების ბიბლიოგრაფიული სია (ბოლო 5-8 წლის სიღრმით). ანბანური წყობით წარმოდგენილ ბიბლიოგრაფიულ სიაში მიუთითეთ ჯერ სამამულო, შემდეგ უცხოელი ავტორები (გვარი, ინიციალები, სტატიის სათაური, ჟურნალის დასახელება, გამოცემის ადგილი, წელი, ჟურნალის №, პირველი და ბოლო გვერდები). მონოგრაფიის შემთხვევაში მიუთითეთ გამოცემის წელი, ადგილი და გვერდების საერთო რაოდენობა. ტექსტში კვადრატულ ფხიხლებში უნდა მიუთითოთ ავტორის შესაბამისი N ლიტერატურის სიის მიხედვით. მიზანშეწონილია, რომ ციტირებული წყაროების უმეტესი ნაწილი იყოს 5-6 წლის სიღრმის.

9. სტატიას თან უნდა ახლდეს: ა) დაწესებულების ან სამეცნიერო ხელმძღვანელის წარდგინება, დამოწმებული ხელმოწერითა და ბეჭდით; ბ) დარგის სპეციალისტის დამოწმებული რეცენზია, რომელშიც მითითებული იქნება საკითხის აქტუალობა, მასალის საკმაობა, მეთოდის სანდოობა, შედეგების სამეცნიერო-პრაქტიკული მნიშვნელობა.

10. სტატიის ბოლოს საჭიროა ყველა ავტორის ხელმოწერა, რომელთა რაოდენობა არ უნდა აღემატებოდეს 5-ს.

11. რედაქცია იტოვებს უფლებას შეასწოროს სტატია. ტექსტზე მუშაობა და შეჯერება ხდება საავტორო ორიგინალის მიხედვით.

12. დაუშვებელია რედაქციაში ისეთი სტატიის წარდგენა, რომელიც დასაბეჭდად წარდგენილი იყო სხვა რედაქციაში ან გამოქვეყნებული იყო სხვა გამოცემებში.

აღნიშნული წესების დარღვევის შემთხვევაში სტატიები არ განიხილება.

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PHARMACOLOGY OF POST-TRAUMATIC STRESS DISORDER

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Abstract.

The aim of this study was to evaluate current approaches to the pharmacotherapy of posttraumatic stress disorder.

An information search was carried out in the databases PubMed, Ovid, EMBASE by keywords: “posttraumatic stress disorder”, “treatment”, and “medications”. Search depth 2012-2022 years. From the general data (4877 articles) there were selected 14 articles with the highest degree of relevance. A content analysis of selected articles was carried out with the formation of recommendations for the use of pharmacotherapy in posttraumatic stress disorder.

Currently, there are no unified approaches to the pharmacotherapy of posttraumatic stress disorder. Antidepressants (SSRI SNRIs) are primarily considered as first-line drugs, but only sertraline, paroxetine, and fluoxetine are approved by the FDA. But these drugs have a fairly wide range of side effects, including suicidal thoughts. The use of benzodiazepines should be limited as they increase the risk of developing posttraumatic stress disorder.

Vortioxetine becomes a very promising option. The most significant benefits of vortioxetine are the significant positive effects of vortioxetine on attention, memory, and executive function.

There is some evidence for the use of alpha-1 adrenoceptor antagonists and alpha-2 adrenoceptor agonists in therapy. In insomnia the use of prazosin and trazodone is recommended.

Pharmacotherapy of posttraumatic stress disorder requires administration of medications with multimodal action. Currently, there are no unified approaches to the pharmacotherapy of posttraumatic stress disorder. Further randomized clinical trials are necessary for developing effective treatment of posttraumatic stress disorder.

Key words. Post-traumatic stress disorder, Russo-Ukrainian war, pharmacotherapy, medications, treatment.

Introduction.

The optimistic statements of Francis Fukuyama that the Cold War will be the last war in the history of mankind have been refuted. Indeed, open military conflicts between states have decreased, but violence against civilians has not decreased. The bloodiest conflicts of the last two decades were Second Congo War (1998-2003), Syrian Civil War (since 2011), Darfur Conflict (since 2003), Iraq War (2003-2011), Afghanistan War (since 2001), Boko Haram insurgency (since 2009) and Operation Enduring Freedom - Trans Sahara (since 2007), South Yemen insurgency (since 2009) and Russo-Ukrainian War (since 2014) [1,2]. The last war has become a real challenge to modern civilization. Russia's perfidious attack on peaceful

cities and villages of Ukraine has become a source of suffering for the civilian population [3,4]. Thousands of Ukrainians died, more than one and a half million Ukrainians became refugees. In the conditions of shelling and carpet bombing, children are born in bomb shelters, chronic patients do not receive proper medical care, millions of people suffer from food shortages. In many regions of Ukraine, hostilities have led to a humanitarian catastrophe [5,6].

Under these conditions, the risk of developing post-traumatic conditions, including posttraumatic stress disorder, increases significantly. Posttraumatic stress disorder (PTSD) – is a severe mental state resulting from a single or recurring event that has a super-powerful negative impact on the human psyche. The traumatic nature of the event is closely related to the feeling of one's own helplessness due to the inability to act effectively in a dangerous situation [4,5]. Warfare is one of the most powerful stressors, indeed with changes of mortality and picture of disease rate, changes in medical service and medicine reactivity [6-8].

In PTSD, for more than a month after psychological trauma, a group of characteristic symptoms persist, such as psychopathological re-experiencing (flashbacks), avoidance of what can activate memories of the trauma, nightmares, and high levels of anxiety. Sometimes there are dissociative reactions and amnesia [9]. Symptoms of PTSD can appear both immediately after the trauma and many years after the traumatic event [9,10]. PTSD can lead to problems such as depression, generalized anxiety disorder, panic attacks, addictions, suicidal behaviors etc [5,11].

Several criteria should have place for PTSD [10]:

Criterion A: stressor (one required): The person was exposed to: death, threatened death, actual or threatened serious injury, or actual or threatened sexual violence, in the following way(s):

- Direct exposure
- Witnessing the trauma
- Learning that a relative or close friend was exposed to a trauma
- Indirect exposure to aversive details of the trauma, usually in the course of professional duties (e.g., first responders, medics)

Criterion B: intrusion symptoms (one required): The traumatic event is persistently re-experienced in the following way(s):

- Unwanted upsetting memories
- Nightmares
- Flashbacks
- Emotional distress after exposure to traumatic reminders
- Physical reactivity after exposure to traumatic reminders

Criterion C: avoidance (one required): Avoidance of trauma-related stimuli after the trauma, in the following way(s):

- Trauma-related thoughts or feelings
- Trauma-related external reminders

Criterion D: negative alterations in cognitions and mood (two required): Negative thoughts or feelings that began or worsened after the trauma, in the following way(s):

- Inability to recall key features of the trauma
- Overly negative thoughts and assumptions about oneself or the world
- Exaggerated blame of self or others for causing the trauma
- Negative affect
- Decreased interest in activities
- Feeling isolated
- Difficulty experiencing positive affect

Criterion E: alterations in arousal and reactivity: Trauma-related arousal and reactivity that began or worsened after the trauma, in the following way(s):

- Irritability or aggression
- Risky or destructive behavior
- Hypervigilance
- Heightened startle reaction
- Difficulty concentrating
- Difficulty sleeping

Criterion F: duration (required): Symptoms last for more than 1 month.

Criterion G: functional significance (required): Symptoms create distress or functional impairment (e.g., social, occupational).

Criterion H: exclusion (required): Symptoms are not due to medication, substance use, or other illness.

two specifications:

• **Dissociative Specification** In addition to meeting criteria for diagnosis, an individual experiences high levels of either of the following in reaction to trauma-related stimuli:

◦ **Depersonalization.** Experience of being an outside observer of or detached from oneself (e.g., feeling as if "this is not happening to me" or one were in a dream).

◦ **Derealization.** Experience of unreality, distance, or distortion (e.g., "things are not real").

• **Delayed Specification.** Full diagnostic criteria are not met until at least six months after the trauma(s), although onset of symptoms may occur immediately.

Neurobiology of PTSD is complex [9,11]. Along with endocrine shifts associated with changes in the functioning of the hypothalamic-pituitary-adrenal axis, patients have abnormal regulation of the secretion of catecholamines, serotonin, amino acids, peptides, and opioid neurotransmitters involved in neural networks that regulate stress reactions [11].

Patients with PTSD have persistent sympatheticotonia, increased autonomic reactivity against the background of suprasegmental structures activation and inadequate autonomic maintenance [11]. There is also a change in the activity of serotonergic structures, and the response to affective and stress reactions varies depending on the intensity of the stressor, involved brain zones, and the type of affected receptors. Dorsal raphe 5HT neurons are believed to mediate anxiogenic effects

through 5HT2 receptors through projections to the amygdala and hippocampus. In contrast, 5HT neurons of the median raphe mediate anxiolytic effects, promote extinction, and downregulate the encoding of learned associations through 5HT1A receptors. Uncontrolled stress leads to changes in the reactivity of GABA and benzodiazepine receptors. An important aspect of pathogenesis is the hyperactivation of glutamatergic structures, with the implementation of the mechanisms of excitotoxicity. This can subsequently lead to the loss of neurons or disruption of their integrity in the hippocampus and prefrontal cortex. Elevated levels of glucocorticoids characteristic of chronic stress increase the expression of NMDA receptors, which may make the brain more vulnerable to excitotoxic damage during stress. An important mechanism here is the effect of CRH on the neurons of the hypothalamic PVN, which integrate information related to stress, and thus ensure the generation of stable excitation patterns [9-11].

The aim of the study was to evaluate current approaches to the pharmacotherapy of PTSD.

Materials and Methods.

An information search was carried out in the databases Pubmed, Ovid, EMBASE by keywords: "posttraumatic stress disorder", "treatment", and "medications". Search depth 2012-2022 years. From the general data (4877 articles) there were selected 14 articles with the highest degree of relevance. A content analysis of selected articles was carried out with the formation of recommendations for the use of pharmacotherapy in PTSD.

To determine the articles for inclusion, the authors carefully reviewed all abstracts and applied specific criteria. The chosen studies needed to be published in peer-reviewed scientific journals and written in English. Peer-reviewed scientific journals ensured that the articles have undergone evaluation by experts in the field and met certain scientific requirements. Due to practical reasons, studies not published in English were excluded from the selection process. When assessing the articles, several factors were considered as reason for exclusion, including the lack of provided correlations, absence of quantitative measurements, and the failure to evaluate any psychological or physical variables. In many cases, articles were not considered due to the absence of necessary inclusion criteria, while others were discarded due to a combination of multiple missing criteria. As results of such selection the most cited or are the results of multi-center studies were included in that review.

Results and Discussion.

Currently, there are no unified approaches to the pharmacotherapy of PTSD [12-13]. Antidepressants (SSRI SNRIs) are primarily considered as first-line drugs, but only sertraline, paroxetine, and fluoxetine are approved by the FDA. But these drugs have a fairly wide range of side effects, including suicidal thoughts.

The use of benzodiazepines should be limited as they increase the risk of developing PTSD [12].

Vortioxetine becomes very promising option. The most significant benefits of vortioxetine are the significant positive

effects of vortioxetine on attention, memory, and executive function [13].

There is some evidence for the use of alpha-1 adrenoceptor antagonists and alpha-2 adrenoceptor agonists in therapy [14] (Table 1).

Table 1. The medications using for pharmacotherapy of PTSD.

Class	Name	Notes
SSRI	sertraline	FDA approved
	paroxetine	FDA approved
	fluoxetine	FDA approved
	escitalopram	
	citalopram	
SNRI	milnacipran	
	duloxetine	
	venlafaxine	
SARI	trazodone	
Polymodal antidepressants	vortioxetine	
Beta-blockers	propranolol	
Alpha-1 receptors antagonists	prazosin	
Atypical antipsychotics	risperidone	
	quetiapine	
	olanzepine	

In addition, many authors recommend the use of non-selective beta-blockers, in particular propranolol [15,16]. Thus, patients with post-traumatic stress disorder who actively recalled their traumatic event, under the influence of propranolol, showed a significant decrease in symptom scores on the CAPS and PCL-S scales, compared with patients who received placebo [15]. This effect could be explained by the psychopharmacology of adrenoceptors [16].

α 1 and β 1 receptors are localized mainly on postsynaptic membranes and respond to the action of norepinephrine released from the nerve endings of the postganglionic neurons of the sympathetic division. α 2- and β 2-receptors are extrasynaptic and are also present on the presynaptic membrane of the same neurons. Both epinephrine and norepinephrine act on α 2 receptors. β 2 receptors are sensitive mainly to adrenaline. Norepinephrine acts on the α 2 receptors of the presynaptic membrane according to the principle of negative feedback - it inhibits its own release. Under the action of adrenaline on β 2-adrenergic receptors of the presynaptic membrane, the release of norepinephrine increases [16].

The significance of receptors can be briefly characterized as follows:

α 1 - localized in arterioles, stimulation leads to spasm of arterioles, increased pressure, reduced vascular permeability and reduced exudative inflammation.

α 2 - mainly presynaptic receptors, are a "negative feedback loop" for the adrenergic system, their stimulation leads to a decrease in blood pressure.

β 1 - stimulation leads to increasing cardiac rate and contractility, activation of renin system and processes of lipolysis.

β 2 - stimulation leads to dilatation of vessels and bronchus, decreasing of peripheral resistance, activation of glycolytic

processes in muscle and liver, releasing of glucagon, relaxation of uterine smooth muscle.

Affinity of the receptor subtypes is characterized by prevalence of norepinephrine for α 1, epinephrine for α 2 and significantly for β 2 [17].

A common manifestation of PTSD is insomnia. In addition to non-pharmacological methods, the use of prazosin and trazodone is recommended [18,19].

The advantages of trazodone are due to the fact that it does not have a noticeable effect on the neuronal uptake of catecholamines, but selectively blocks the uptake of serotonin and has an α -adrenergic blocking effect [19].

The use of other hypnotics currently does not have a sufficient evidence base [20].

The expediency of using neuroleptics and anticonvulsants is discussed [21-24]. One study shows that adding risperidone to standard antidepressant therapy significantly improves outcomes in patients with post-traumatic stress disorder without causing additional side effects [21]. A meta-analysis of nearly 400 patients showed that those who received risperidone as adjunctive therapy not only experienced significant improvements in general and key aspects of PTSD symptoms, but also demonstrated significant reductions in anxiety scores compared to those who received placebo [22].

Moderate doses of quetiapine were effective 42% overall improvement in PTSD symptoms based on the CAPS and significant improvement in such dimension of symptoms like re-experiencing ($Z=-3.24$, $P=0.0012$), hyperarousal ($Z=-3.30$, $P=0.001$) and avoidance ($Z=-2.13$, $P=0.03$) [18].

Compared with placebo, the SSRIs and atypical antipsychotics drugs had significant efficacy whether in patients with severe or extremely severe PTSD status. However, only atypical antipsychotics (SMD = -0.29, 95% CI: -0.48 to -0.10) showed superior efficacy than placebo [24]. There is no evidence base for the use of nootropics, herbal sedatives, and other classes of drugs, and anecdotal reports of positive results from their use can be explained by the placebo effect [25,26].

It is necessary to remind for all discussed above that combination of influence of Covid-19 pandemic state [27-29]. and dramatic events are unclear for mental health [30-32], mortality of other crucial condition [33-34] importance of classical and modern methods of investigation [35-36] with more implementation of non-invasive methods [36-38].

Simultaneously, we should conclude that PTSD may cause significant levels of individual distress and functional impairment [39,40]. Post-traumatic stress disorder is characterized by diagnostic criteria that include a history of exposure to a traumatic event (or events) and symptoms from each of the 3 symptom clusters: intrusive recollections (cluster B), avoidance/numbing (cluster C), and hyperarousal (cluster D). Over the past several decades, we have gained greater insight into the diagnosis, treatment, and natural history of PTSD. Standard treatments for PTSD include pharmacotherapy and psychotherapy. Pharmacotherapy targets symptoms such as anxiety, arousal, and depression [39].

Psychotherapy ranges from supportive and skills-building approaches to exposure-based therapies that address

dysregulated traumatic memories. Post-traumatic stress disorder is a debilitating mental illness with limited treatment options and a high treatment dropout rate [41]. Psychedelics, often in combination with psychotherapy, are now under investigation as a potential treatment option for a variety of psychiatric conditions including PTSD. Both treatments aim to alleviate symptoms and promote improvement of patient status.

Conclusion.

Pharmacotherapy of posttraumatic stress disorder requires administration of medications with multimodal action, and standard treatments for PTSD should include pharmacotherapy and psychotherapy as currently, there are no unified approaches to the pharmacotherapy of PTSD. Further randomized clinical trials are necessary for developing effective treatment of PTSD, management of PTSD and especially PTSD-related syndromes and comorbidities. Rigorous preclinical and clinical studies are needed to validate effectiveness and mechanisms of multimodal therapy pharmacotherapy of posttraumatic stress.

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The authors declare that the research was conducted in the absence of any commercial or financial relationships that could be construed as a potential conflict of interest.

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