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THE INFLUENCE OF MOTOR ACTIVITY ON THE FORMATION OF STRESS RESISTANCE IN SERVICEMEN WHILE PERFORMING SPECIAL SERVICE AND COMBAT MISSIONS

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The article is aimed to investigate the influence of motor activity on the formation of stress resistance in servicemen while performing special service and combat missions. The research involved 123 commissioned officers aged 30–55 who performed tasks in the combat zone (up to 6 months) at headquarters (command posts) in managerial positions. Group A (n = 37) was formed by commissioned officers who regularly engaged in physical exercises, and Group B (n = 86) by commissioned officers who did not adhere to the regimen of motor activity. Methods: bibliosemantic, questionnaire survey, psychoanalytic, statistical. It has been established that all servicemen, without exception, experience stress while performing service and combat missions. Somatic symptoms of stress are inherent in both commissioned officers who regularly exercised and those who did not adhere to the regimen of motor activity. However, the frequency of stress symptoms in commissioned officers of Group B is significantly ($p < 0.001$) higher than in Group A. The level of stress, assessed by three psychodiagnostic methods, in commissioned officers of Group A after returning from the secondment was significantly lower than in Group B ($p < 0.05–0.01$). This suggests that regular motor activity while performing service and combat missions can alleviate the negative impact of stressors, it increases the stress resistance of commissioned officers, helps to restore their emotional state, maintain physical and mental health, and, accordingly, improve professional and combat performance.

Key words: stress, stress resistance, officers, servicemen, motor activity, health.

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ВПЛИВ РУХОВОЇ АКТИВНОСТІ НА ФОРМУВАННЯ СТРЕСОСТІЙКОСТІ ВІЙСЬКОВОСЛУЖБОВЦІВ ПІД ЧАС ВИКОНАННЯ СПЕЦІАЛЬНИХ СЛУЖБОВО- БОЙОВИХ ЗАВДАНЬ

Метою дослідження було дослідити вплив рухової активності на формування стресостійкості військовослужбовців під час виконання спеціальних службово-бойових завдань. До дослідження було залучено 123 офіцери віком 30–55 років, які виконували завдання у зоні бойових дій (до 6 місяців) у штабах (командних пунктах) на посадах управлінського рівня. Було сформовано групу А (n=37) – офіцери, які регулярно займалися фізичними вправами, та групу В (n=86) – офіцери, які не дотримувалися режиму рухової активності. Методи: бібліосемантичний, анкетування, психодіагностичний, статистичний. Встановлено, що стрес під час виконання службово-бойових завдань відчувають усі без виключення офіцери. Соматичні симптоми стресу притаманні і офіцерам, які регулярно займалися фізичними вправами, і тим, які не дотримувалися режиму рухової активності. Однак, частота прояву симптомів стресу у офіцерів групи В є достовірно ($p < 0,001$) вищою, ніж у групі А. Рівень стресу, що оцінювався за трьома психодіагностичними методиками, в офіцерів групи А після повернення з відрадження виявився достовірно нижчим, ніж у групі В ($p < 0,05–0,01$). Це дозволяє стверджувати, що регулярна рухова активність у процесі виконання службово-бойових завдань дозволяє полегшити негативний вплив стресорів, підвищує стресостійкість офіцерів, сприяє відновленню їх емоційного стану, підтриманню фізичного і психічного здоров'я, та, відповідно, покращанню показників професійної та бойової діяльності.

Ключові слова: стрес, стресостійкість, офіцери, військовослужбовці, рухова активність, здоров'я.

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The full-scale war in Ukraine has been going on for three years now, and every day that our citizens live is stressful for them. This applies to everyone: both military personnel and civilians. Stress during the war affects everyone in one way or another, although its strength, intensity, and consequences for mental and physical health are slightly different for everyone. Stress is a body reaction that responds to physical or mental tension or a threat to life [5]. During the war, all these factors combine to complicate the situation. Thus, among the main factors (stressors) that cause stress in servicemen are constant expectation of danger to life and health; being in a state of uncertainty; being in a dangerous environment; sudden loud explosions and shots; witnessing traumatic injuries and deaths of colleagues, enemy abuse of prisoners and civilians; unregulated diet and rest; physical exhaustion; prolonged lack of sleep; long separation from loved ones, and others [1, 8, 10]. The stressors of the managerial level personnel (commissioned officers of

headquarters, command posts) include high psycho-emotional stress; high intensity of tasks; intensity of actions; intellectual stress; the need for intensive perception, processing, and interpretation of large amounts of information; decision-making in uncertain situations with increased responsibility; high cost of wrong decisions; performing tasks in conditions of severe time pressure, confined space, hypokinesia, high noise level, insufficient lighting, etc. These stressors threaten servicemen's lives, adversely affect their health, reduce the effectiveness of service and combat activities, or lead to disruption [11, 14].

The very nature of stress is quite complex. Stress triggers a kind of chain reaction, which in turn causes several characteristic symptoms. These can be both psycho-emotional and somatic disorders in military personnel. The former include increased irritability, aggressiveness, decreased ability to experience pleasure, problems with concentration, and cognitive thinking. In addition, under stress, people suffer from various gastrointestinal problems, skin rashes, insomnia, and tachycardia. Many people under stress develop panic attacks i. e., sudden attacks of fear and severe anxiety, accompanied by a feeling of shortness of breath, sweating, whole-body tremors, nausea, and a significant increase in heart rate [3, 6]. If the effect of the stressor is long enough and the stress has become chronic, its symptoms may not be as pronounced, but the body continues to suffer. In this state, some servicemen try a "comfort eat" or refuse to eat. The result is severe weight loss or weight gain. In addition, various diseases can develop against the background of stress during the war: cardiovascular, neurological or infectious diseases, problems with the digestive endocrine systems, sexual and mental disorders, etc. [15]. Scientists note that stress can either be adapted to or its cause can be eliminated. Among the main areas of stress management during war, accelerating adaptation to stress and avoiding its negative consequences, experts [12] identify regulation (if possible) of the work and rest (sleep) regime: rational (healthy), balanced (vitaminized) nutrition; constant motor activity; application of methods of mental self-regulation (autogenous training, breathing exercises, meditation, self-massage, work with biologically active points, exercises to relieve tension, etc.); complete rejection of bad habits. Instead, the effectiveness of motor activity (regular exercise) during service and combat missions in forming stress resistance in managerial level personnel (commissioned officers of headquarters, command posts) is one of the least studied problems.

The purpose of the study was to investigate the influence of motor activity on the formation of stress resistance in servicemen while performing special service and combat missions.

Materials and methods. The research was conducted at Bohdan Khmelnytskyi National Academy of the State Border Guard Service of Ukraine (NASBGSU) in 2022–2024. The research involved 123 male servicemen (senior commissioned officers with the military ranks of major, lieutenant colonel, and colonel) aged 30–55 years who performed special service and combat missions in the combat zone on a rotational basis (up to 6 months) at headquarters (command posts) in managerial positions. By interviewing officers after returning to their permanent place of service, we found that 37 commissioned officers (30.1 %) regularly (three times a week or more) engaged in physical exercises (motor activity) during the period of their assignments (Group A). The rest of the commissioned officers (86 people; 69.9 %) did not adhere to the regimen of constant motor activity during the rotation for various reasons (they exercised irregularly, less than three times a week, or did not exercise at all, Group B).

To achieve the aim of the research, we used the following scientific methods: bibliosemantic, questionnaire survey, psychoanalytic, and statistical. The survey was conducted using the author's questionnaire, which contains 12 questions and is designed to identify the frequency of psychosomatic symptoms of stress in commissioned officers of Groups A and B (sleep disturbance, loss of appetite, physical fatigue, stomach upset, headache, pain in the heart, muscles, joints, etc.). Officers categorized the frequency of symptoms into three levels: often, sometimes, and never. The psychological examination was used to identify psychological symptoms of stress in commissioned officers of groups A and B and was carried out using three methods (Kliapets, Lazorenko, Liepikhova, Savinov, 2009): 1) PSM-25 Psychological Stress Scale; 2) Assessment of Professional Stress; 3) Inventory of Stress Symptoms. The "PSM-25 Psychological Stress Scale" method contained 25 questions-assertions characterizing the officer's state, answering which the officer chose the frequency of their manifestation from 1 to 8, where 1 – never, 8 – constantly. Stress was assessed by the sum of points, where a low level of stress corresponded to the sum of 99 points or less; mean – 100–125 points; high – 125 points or more. The "Assessment of Professional Stress" method is based on the understanding of professional stress as an index of mental stress relevant at the time of measurement, which is interpreted as a level of threat to the mental health of a serviceman. The examinee must indicate the frequency of occurrence of a particular stressful phenomenon in his or her professional activity. It contains 15 questions, answering which the respondent gives from 1 to 5 points (1 – never, 5 – always). The level of professional stress is considered low if an officer scores 15–30 points, mean – 31–50 points, and high – 51–75 points. The "Inventory of Stress Symptoms" method permits to assess the frequency of their manifestation and the degree of exposure to

the negative effects of stress. Subjects are offered 20 stress symptoms to assess the frequency of their manifestations on a four-point scale: 1 – never, 2 – rarely, 3 – often, and 4 – always. The level of stress symptoms was determined by the sum of points and was assessed as low if the officer scored up to 45 points; mean – 45–60 points; high – 60–80 points.

The reliability of the difference between the indices that were evaluated in percentage terms was determined using Pearson's Chi-square (χ^2) criterion, all other indices were evaluated using Student's t-test. The significance for all statistical tests was set at $p < 0.05$. All statistical analyses were performed with the IBM SPSS Statistics 21 software, adapted to medical and biological researches. This study followed the regulations of the World Medical Association Declaration of Helsinki. The topic of the research was approved by the Academic Council of the NASBGU (Protocol No. 4 of October 10, 2022). Informed consent was obtained from all officers who participated in this research.

Results of the study and their discussion. The results of the assessment of the frequency of somatic symptoms of stress in commissioned officers of groups A and B while performing special service and combat missions in the combat zone from 2022 to 2024 are presented in Table 1.

Table 1

Frequency of somatic symptoms of stress in commissioned officers of groups A and B while performing their service and combat missions, number of people/%.

Symptoms of stress	Frequency	Group A (n=37)	Group B (n=86)	Reliability of the difference
Sleep disorders/insomnia	often	8/21.6	29/33.7	$\chi^2=12.9$ $p < 0.001$
	sometimes	24/64.9	56/65.1	
	never	5/13.5	1/1.2	
Physical fatigue (exhaustion)	often	9/24.3	47/54.7	$\chi^2=20.4$ $p < 0.001$
	sometimes	25/67.6	37/43.0	
	never	3/8.1	2/2.3	
Loss of appetite/constant feeling of hunger	often	2/5.4	11/12.8	$\chi^2=16.7$ $p < 0.001$
	sometimes	22/59.5	65/75.6	
	never	13/35.1	10/11.6	
Stomach upset/nausea	often	5/13.5	14/16.3	$\chi^2=5.23$ $p < 0.001$
	sometimes	9/24.3	32/37.2	
	never	23/62.2	40/46.5	
Headache	often	9/24.3	39/45.4	$\chi^2=25.2$ $p < 0.001$
	sometimes	16/43.3	42/48.8	
	never	12/32.4	5/5.8	
Pain in muscles, joint/tremors	often	4/10.8	17/19.8	$\chi^2=6.42$ $p < 0.001$
	sometimes	31/83.8	59/68.6	
	never	2/5.4	10/11.6	
Neck and back pain	often	8/21.6	32/37.2	$\chi^2=13.5$ $p < 0.001$
	sometimes	18/48.6	45/52.3	
	never	11/29.8	9/10.5	
"Heavy chest"/pain in the heart area	often	2/5.4	15/17.4	$\chi^2=16.4$ $p < 0.001$
	sometimes	5/13.5	24/27.9	
	never	30/81.1	47/54.7	
Skin rashes/excessive sweating	often	0/0	6/7.0	$\chi^2=7.80$ $p < 0.001$
	sometimes	6/16.2	17/19.8	
	never	31/83.8	63/73.2	
Heart palpitations/tachycardia	often	1/2.7	4/4.7	$\chi^2=4.67$ $p < 0.001$
	sometimes	4/10.8	18/20.9	
	never	32/86.5	64/74.4	
"Lump" in the throat/breathing problems	often	0/0	2/5.4	$\chi^2=5.79$ $p < 0.001$
	sometimes	2/5.4	7/8.1	
	never	35/94.6	77/89.5	
Colds and flu diseases	often	4/10.8	32/37.3	$\chi^2=20.3$ $p < 0.001$
	sometimes	28/75.7	49/56.9	
	never	5/13.5	5/5.8	

Legend: χ^2 – Pearson's Chi-square criterion value; p – reliability of the difference between the indicators of groups A and B

The analysis of the survey results presented in Table 1 shows that all commissioned officers who took part in the survey experienced stress while performing special service and combat missions at headquarters (command posts). All somatic stress symptoms are inherent in commissioned officers who regularly exercised and those who did not adhere to the motor activity regimen. However, the frequency of

all psychosomatic stress symptoms in Group B officers is significantly ($p < 0.001$) higher than in Group A, which indicates the efficacy of motor activity in reducing the negative impact of stress on the body of military personnel. Thus, sleep disturbances (insomnia) were often experienced by 21.6 % of officers in Group A and 33.7 % in Group B, and sometimes by 64.9 % of Group A and 65.1 % of Group B. At the same time, 13.5 % of commissioned officers in Group A never had sleep problems, and only 1.2 % in Group B. Physical fatigue (exhaustion) was frequently experienced by 24.3 % of commissioned officers in Group A, in contrast to Group B, where 54.7 % of commissioned officers were found to have such problems. Interruptions in eating habits (loss of appetite or, conversely, a constant feeling of hunger), as a pronounced sign of stress, were often experienced by 5.4 % of commissioned officers in Group A and 12.8 % in Group B, sometimes by 59.5 % of Group A and 75.6 % of Group B, and never by 35.1 % of Group A and 11.6 % of Group B. The majority of commissioned officers in Group A (62.2 %) have never experienced problems with the gastrointestinal tract; there were 46.5 % in Group B. Headaches are a frequent companion of stress, often and sometimes experienced by 24.3 % and 43.3 % of commissioned officers in Group A and 45.4 % and 48.8 % of commissioned officers in Group B, respectively. Muscle and joint pain and back and neck pain were frequently experienced by 10.8 % and 21.6 % of commissioned officers in Group A and 19.8 % and 37.2 % of commissioned officers in Group B, respectively. Heart pain never bothered 81.1 % of commissioned officers in Group A and 54.7 % of commissioned officers in Group B. Skin rashes, excessive sweating, tachycardia, and breathing problems are also not common signs of stress – most commissioned officers in Groups A and B have virtually no such symptoms. Colds, as a result of a decrease in immunity in commissioned officers under prolonged exposure to stressors, are often detected in 10.8 % of commissioned officers in Group A and 37.3 % in Group B. During the rotation period, 13.5 % of commissioned officers in Group A and 5.8 % of commissioned officers in Group B have never been ill.

Assessment of the dynamics of stress level in commissioned officers before the secondment and after returning with the help of three psychodiagnostic methods shows that before the rotation, the level of stress in commissioned officers of groups A and B was significantly the same ($p > 0.05$) and corresponded to a low level (Table 2).

Table 2

The level of stress among commissioned officers of groups A and B while performing service and combat missions ($M \pm m$), points

Research stages	Group A (n=37)	Group B (n=86)	Reliability of the difference
The "PSM-25 Psychological Stress Scale" method			
Before	82.5±1.89	85.7±1.44	t=1.35; p>0.05
After	109.8±2.29***	116.8±1.92***	t=2.34; p<0.05
The "Assessment of Professional Stress" method			
Before	28.8±1.74	27.9±1.35	t=0.40; p>0.05
After	35.4±1.82*	43.5±1.47***	t=3.46; p<0.01
The "Inventory of Stress Symptoms" method			
Before	37.4±1.96	39.1±1.51	t=0.69; p>0.05
After	48.3±2.07**	55.7±1.73***	t=2.74; p<0.05

Legend: M – arithmetic mean; m – error of arithmetic mean; t – t-test value; p – reliability of the difference between the indicators of groups A and B; *, **, *** – reliability of the difference between the indicators of each Group According to $p < 0.05$. $p < 0.01$. $p < 0.001$ respectively

During the period of performing special service and combat missions, the stress level of commissioned officers of both groups significantly ($p < 0.05$ – 0.001) worsened, which confirms our previous conclusions about the presence of several negative factors (stressors) that accompany the professional activities of managerial level personnel (officers of headquarters, command posts). However, the commissioned officers who adhered to the regimen of regular motor activity after the rotation had significantly ($p < 0.05$ – 0.01) better stress indices than the commissioned officers of Group B. Thus, after returning from the secondment, the level of stress assessed by the "PSM-25 Psychological Stress Scale" in commissioned officers of Group A was 7.0 points lower than in Group B ($p < 0.05$); according to the "Assessment of Professional Stress" method – by 8.1 points ($p < 0.01$); according to the "Inventory of Stress Symptoms" – by 7.4 points ($p < 0.05$). At the end of the study, the stress level of commissioned officers in both groups corresponds to the mean level according to all three methods. However, the change during the period of the secondment in commissioned officers of Group B was more pronounced than in Group A. This suggests that regular motor activity (physical exercises) while performing special service and combat missions helps to alleviate the effects of negative factors (stressors) on the body of a serviceman, helps to restore physical and psycho-emotional state, maintain physical and mental health in a normal state and, accordingly, improve the indicators of professional and combat activities.

Experts [4] argue that today, in times of war, one of the greatest threats to both psychological and physical health is stress. Stress occurs in conditions of risk, and time pressure, when it is necessary to make important decisions quickly and independently, to respond instantly to threats and surprises. Stress is a tension of defense forces, mobilization of internal resources, and energy supply of opportunities for solving new tasks. The critical value of stress, after which it becomes destructive, is different for each person. Since stress has its own somatic and psychological signs (symptoms), it is very important not to miss them and to take the necessary measures to prevent, reduce, and restore the psychophysical state of the body. Stress undermines the immune system and makes people vulnerable to infections. According to scientists [9], the far from a complete list of pathologies caused by stress includes depression, anxiety, heart attack, stroke, weakening of the immune system, and, as a result, vulnerability to various infections, ranging from colds and herpes to serious diseases of organs and body systems. Stress often causes skin reactions (rashes, itching, various dermatitis, etc.), gastrointestinal disorders, insomnia, various neurological diseases, and other psychosomatic disorders. Under such conditions, scientists [7], among other stress prevention measures, recommend maintaining motor activity, which helps reduce the level of the stress hormone cortisol. The benefits of motor activity for stress prevention [13] include: strengthening the cardiovascular and respiratory systems; normalization of cholesterol, blood glucose, and blood pressure; strengthening muscles, bones, and ligaments; improving the level of physical development; reducing the risk of injury, strengthening the musculoskeletal system; improving brain activity, increasing oxygen supply to the brain; enhancing creativity; improving mood, etc. Our results confirmed the conclusions of many scientists [2, 12, 13] regarding the efficacy of motor activity in reducing stress and increasing stress resistance in military personnel while performing special service and combat missions.

Conclusion

It has been established that all servicemen, without exception, experience stress while performing service and combat missions. Somatic symptoms of stress are inherent in both commissioned officers who regularly exercised and those who did not adhere to the regimen of motor activity. However, the frequency of stress symptoms in commissioned officers of Group B is significantly ($p < 0.001$) higher than in Group A, which indicates the effectiveness of motor activity in reducing the negative impact of stress on the body of military personnel. The level of stress, assessed by three psychodiagnostic methods, in commissioned officers of Group A after returning from the secondment was significantly lower than in Group B ($p < 0.05-0.01$). This suggests that regular motor activity while performing service and combat missions can alleviate the negative impact of stressors, it increases the stress resistance of commissioned officers, helps to restore their emotional state, maintain physical and mental health, and, accordingly, improve professional and combat performance.

Prospects for further research. It is planned to study the effect of motor activity on overcoming distress in military personnel after performing service and combat missions.

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STRUCTURAL AND FUNCTIONAL CHANGES IN THE TESTICLES AND EJACULATE OF INFERTILE MEN CAUSED BY EPIDEMIC PAROTITIS

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The purpose of the study was to establish the structural and functional changes in the testicles and ejaculate of 12 mature men with a history of epidemic parotitis. Ultrasound scanning and color ultrasound angiography of the testicles were performed in a clinical diagnostic center using a Siemens Sonoline G60S device (Siemens AW, Germany). Testicular volume and hemodynamic parameters were determined: peak arterial velocity, diastolic velocity, average blood flow velocity, and volumetric flow rate. In 7 testicular biopsies of infertile men with this pathology, taken in the urological department of the Regional Clinical Hospital of the Ivano-Frankivsk Regional Council, histostructural changes were studied. In the ejaculate, we studied the concentration of spermatozoa, their morphological forms, and motility according to generally accepted methods. According to ultrasound diagnostics, in infertile men with a history of mumps, the testicular volume decreased, on average, to $17.31 \pm 1.20 \text{ cm}^3$ against $19.50 \pm 1.40 \text{ cm}^3$ in control. Under these conditions, the peak arterial velocity in the testicular artery within the spermatic cord decreased to $14.90 \pm 1.20 \text{ cm/s}$ against $19.30 \pm 1.46 \text{ cm/s}$, and the volumetric flow rate decreased to $14.20 \pm 1.15 \text{ ml/s}$ against $16.50 \pm 1.20 \text{ ml/s}$ in the control. In the examined histological micro preparations made from testicular biopsies of infertile men, the diameter of convoluted seminiferous tubules decreased compared to the control. Laboratory tests of ejaculate in men indicate a decrease in both its volume and the concentration of spermatozoa in it.

Key words: epidemic parotitis, testicle, hemodynamics, spermatogenesis.

Б.В. Грицуляк, С.Б. Герашченко, В.Б. Грицуляк, І.Й. Случик, О.Я. Глодан, О.Є. Халло СТРУКТУРНО-ФУНКЦІОНАЛЬНІ ЗМІНИ В ЯЄЧКАХ ТА ЕЯКУЛЯТІ НЕПЛІДНИХ ЧОЛОВІКІВ, ЗУМОВЛЕНІ ЕПІДЕМІЧНИМ ПАРОТИТОМ

В проведеному нами дослідженні була поставлена мета вивчити структурно-функціональні зміни в яєчках та еякуляті 12-ти чоловіків зрілого віку, в анамнезі яких діагностовано перенесений епідемічний паротит. Ультразвукове сканування та кольорову ультразвукову ангіографію яєчок провели в клініко-діагностичному центрі на апараті Siemens Sonoline G60S («Siemens AW», Німеччина). Визначали об'єм яєчок та показники гемодинаміки в них: пікову швидкість артеріального кровотоку, діастолічну швидкість кровотоку, середню швидкість кровотоку, об'ємний кровоток. У 7-ти біоптатах яєчок неплідних чоловіків з цією патологією, забраних в урологічному відділенні Обласної клінічної лікарні Івано-Франківської обласної ради, досліджували гістоструктурні зміни, а в еякуляті – концентрацію сперматозоїдів, їх морфологічні форми та рухливість за загальноприйнятими методами. За даними ультразвукової діагностики у неплідних чоловіків, в анамнезі яких діагностовано паротит, об'єм яєчок зменшився, в середньому, до $17,31 \pm 1,20 \text{ см}^3$ проти $19,50 \pm 1,40 \text{ см}^3$ у контролі. За цих умов максимальна швидкість кровотоку в яєчковій артерії в межах сім'яного канатика знижується до $14,90 \pm 1,20 \text{ см/с}$ проти $19,30 \pm 1,46 \text{ см/с}$, а об'ємний кровоток зменшився до $14,20 \pm 1,15 \text{ мл/с}$ проти $16,50 \pm 1,20 \text{ мл/с}$ у контролі. В досліджуваних гістологічних мікропрепаратах, виготовлених з біоптатів яєчок неплідних чоловіків діаметр звивистих сім'яних трубочок зменшився в порівнянні з контролем. Проведені лабораторні дослідження еякуляту у чоловіків свідчать про зменшення як його об'єму, так і концентрації у ньому сперматозоїдів.

Ключові слова: епідемічний паротит, яєчко, гемодинаміка, сперматогенез.

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According to the literature, in recent years, there has been a tendency to increase the number of infertile marriages [1, 5]. Moreover, in almost half of the cases, the cause of their development is a violation of spermatogenesis in men caused by various factors, one of which is an infectious factor [9, 12]. Epidemic parotitis (mumps) is an acute infectious viral disease near the ear salivary glands, which often occurs not only in children and adolescents but also in men aged 18–25 [10, 13]. Infection occurs by airborne transmission; the entrance gates are the mucous membranes of the nasal cavity, mouth, and pharynx. The