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IMMUNOLOGICAL CHARACTERISTICS OF PATIENTS WITH WOUND INFECTION ON THE BACKGROUND OF DIABETES

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Abstract: Comparative characteristics of the parameters of the immune system of T- and B-lymphocytes showed the presence of an imbalance and tension in the immune system of patients with wound infection on the background of diabetes mellitus, which indicates the development of a systemic inflammatory reaction syndrome and the occurrence of gross immunological rearrangements reflected in the significant activity of lymphocytes with markers of early activation (CD25+ cells) and the readiness of cells to apoptosis (CD95+ cells), as well as natural killers (CD16+ cells). In patients with wound infection on the background of DM, in comparison with healthy people, it was shown that the content of all studied immunocompetent cells was significantly increased. This fact indicates that all lymphocytes are activated and the immune system is tense, which is associated with a sufficiently high number of pathogens in the focus and the development of systemic inflammatory reaction syndrome (SIRS) in patients, which in our opinion aggravates the course of the wound process.

Key words: immune profile, wound infection, diabetes mellitus.

Relevance: The development of purulent-inflammatory process in soft tissues is associated with the formation of hemorheological disorders. Their particular severity occurs in the presence of a syndrome of systemic reaction to inflammation (1,3,5,7). Correction of hemorheological deviations is realized through a complex effect, including surgical treatment of a purulent lesion, as well as antibacterial and detoxification therapy.

The systemic inflammatory response to infection or sepsis was probably similar to the systemic inflammatory response to a group of different injuries and injuries, such as burns, injuries, etc. The attention of scientists is focused on the development of effective strategies to reduce excessive inflammatory response in patients and obtain improved results (2,4,6,8,10).

Systemic Inflammatory Response Syndrome (SIRS) indicates inflammation outside the infected area that runs throughout the body. It is determined by comparing two or more of the four abnormal representations of body temperature, pulse rate, respiratory rate and white blood cell count (9,11,13,15,17). The SIRS presentation is defined as the most severe degree of infection of various sites, suggesting higher risks of shock or mortality (12,14,16,18,20).

In patients with diabetes mellitus, purulent necrotic soft tissue diseases are about five times more common. At the same time, they are characterized by a special severity of the course, unlike in patients who do not suffer from diabetes mellitus (19,21,23,25,27,29).

It has been established that wound infection in patients with diabetes mellitus (DM) leads to various complications, including the development of systemic inflammatory response syndrome (SIRS), which

negatively affect the results of treatment of this category of patients, often leading to organ dysfunctions (22,24,26,28,30). As is known, wound infection of various etiologies and localization is characterized by the presence of immunodeficiency in the T-link of immunity, an imbalance in the indicators of humoral protection, pro– and anti-inflammatory cytokines (31,33,35).

At the same time, great importance is also attached in the literature to the study of the systemic inflammatory response syndrome (SIRS), which is a universal generalized response of the body to various damaging effects, including systemic and local infection, and is caused by the release of inflammatory mediators into the circulatory system (32,34,36). Manifestations of CVD in patients with wound infection involving a large mass of muscle tissue, fascia, and bone structure, in fact, determine the severity of the disease, contribute to the occurrence of gross immunological rearrangements that lead to the development of CVD, closing the resulting vicious circle (4,5,14,15,16,17).

An integrated approach to assessing the immune status in such patients was conducted extremely rarely, therefore, we considered it advisable to analyze the results obtained to determine the parameters of the immune system of sick and healthy individuals in a comparative aspect.

The purpose of the study: To study and evaluate the immune system indicators of patients with wound infection on the background of diabetes mellitus in comparison with those of healthy individuals.

Material and methods: 153 patients with purulent necrotic lesions of soft tissues (Abscesses, phlegmons, beneficial phlegmons, carbuncles) on the background of diabetes mellitus were involved in the research, of which 97 men (63.3%) and 56 women (36.7%). At the same time, systemic inflammatory reaction syndrome was detected in all the studied patients. Of all the examined patients, 42 were urban residents (27.4%), and 111 people were villagers (72.6%).The average age of the examined patients was 54±17.5 years. The control group consisted of 30 healthy individuals, whose sex and age composition was almost the same as the patients.

To carry out immunological parameters, blood was taken from the ulnar vein into a centrifuge tube treated with 5.0 ml heparin. We selected 10 µl for counting leukocytes and lymphocytes on the Goryaev chamber using Zadorozhny S.I. and Dozmorov I.M. paint (1987).

Mononuclear cells from peripheral blood were obtained by isolation on a density gradient of ficoll verografin with a density of 1,077g/l according to Boyum (1968). The number of cells was counted in the Goryaev chamber by the conventional method under a microscope and the concentration of lymphocytes was adjusted to 2x106 in 1 ml, the viability of lymphocytes was determined in a test with 0.1% trypan blue.

The assessment of the state of the immune system of the body of patients and healthy people was carried out by the expression of CD-differentiation and activation antigens. The following markers of immunocompetent cells were determined: CD3+-, CD4+-, CD8+-, CD16+-, CD20+-, CD23+-, CD38+-, as well as CD25+-, CD95+-lymphocytes. CD receptor expression was carried out in the rosette formation reaction using monoclonal antibodies of the LT series manufactured by Sorbent LLC (RF) according to the method of Garib F.Yu. et al. (1995).

Determination of serum concentrations of the examined immunoglobulins of the main three classes M, A and G was carried out by radial immunodiffusion according to Mancini (1963).

All studies were conducted in the department of purulent surgery of the Bukhara Regional Multidisciplinary Medical Center and at the Institute of Human Immunology and Genomics of the Academy of Sciences of the Republic of Uzbekistan.

The research results were processed using the generally accepted method of variation statistics. A software package for biomedical research was used. The principles of evidence-based medicine were used in the organization and conduct of research.

Results and discussion: The results showed that if a 2.0-fold increase in the number of leukocytes in patients with wound infection (14300±50x109/l) compared to healthy individuals (6300±75x109 /l) was a manifestation of the inflammatory process in the body, then a decrease in the relative and absolute number of lymphocytes (respectively 21.14±1.50% and 2700±170mcl) it indicated a decrease in the resistance of the body of these patients (Table 1).

The study of the relative and absolute number of lymphocytes carrying differentiating CD3+ markers (T-lymphocytes) on their surface showed that they changed in different directions relative to the control data. If the relative number of CD3+ cells significantly decreased by 1.3 times in relation to healthy data (respectively 56.74±1.20% vs. 45.45±1.27%, P<0.05), then the absolute number of these cells was significantly increased by 1.1 times in relation to the norm (respectively 1290±34 µl vs. 1120±23 µl). That is, T-immunodeficiency was established in patients with wound infection on the background of diabetes. Next, we studied the main subpopulations of T lymphocytes - T helper/inducers (CD4+ cells) and T suppressors/cytotoxic lymphocytes (CD8+ cells).

Table.1 Comparative indicators of cellular immunity in patients with diabetic foot syndrome with signs of critical ischemia of the lower extremities and healthy individuals, M±m

Indicators	Control group (healthy individuals)	Patients with wound infection on the background of diabetes
White blood cells, 109 /l	6300±75	14300±50
Lymphocytes, mcl	1953±60	2700±170
Lymphocytes, %	31,51±0,97	21,14±1,50
CD3+ cells, %	56,74±1,20	45,40±1,27
CD3+ cells, mcl	1120±23	1290±34
CD4+ cells, %	31,57±0,70	25,70±2,20
CD4+ cells, µl	618±16	710±59
CD8+ cells, %	22,94±0,65	20,0±1,15
CD8+ cells, µl	452±13	543±32
CD4+/CD8+, units	1,37±0,01	1,31±0,02

The trend and direction of changes in the relative and absolute number of these subpopulations were the same as in CD3+ lymphocytes, but with different intensity. The deficit in the relative number of CD4+ cells in patients was 1.25-fold relative to this parameter in healthy individuals - 25.70±2.20% versus 31.57±0.70%, respectively (P<0.05), but the deficiency of CD8+ cells was little noticeable – the decrease was 1.1 times (respectively 20.0±1.15% versus 22.94±0.65%, P<0.05). In both cases, the absolute values, as in CD3+ lymphocytes, were significantly higher than the control values (P<0.05). Against this background, the immunoregulatory index (CD4+/CD8+) was also significantly reduced in patients with respect to the norm - 1.31±0.02 units, respectively, versus 1.37±0.01 units. (P<0.05).

A comparative study of the relative and absolute number of T lymphocytes (CD3+ cells) and their regulatory subpopulations- T helper/inducers (CD4+ cells) and T suppressors/cytotoxic lymphocytes (CD8+cells) showed that in patients with wound infection against the background of diabetes, the parameters changed with the same tendency and different directions. The absolute numbers of all cells in patients were significantly increased, but the relative values were significantly reduced in relation to the data of healthy individuals.

Considering the fact that in clinical immunology, the activity of the immune system is evaluated by the functional states of the immunocompetent cells of the examined, the relative number of cells indicates the true state of the immune status. Based on this, we found that the studied patients with wound infection have T-immunodeficiency.

At the next stage of the research, we studied the parameters of the B-lymphocyte system, the results of which are shown in Table 2.

Table 2 Comparative indicators of the B-lymphocyte system and humoral immunity in patients with diabetic foot syndrome with signs of critical lower limb ischemia and healthy individuals, M±m

Indicators	Control group (healthy individuals)	Patients with wound infection on the background of diabetes
CD20+ cells, %	19,42±1,39	22,80±0,96
CD20+ cells, µl	379±27	619±26
CD23+ cells, %	12,86±0,50	19,25±1,48
CD23+ cells, µl	251±10	523±40
IgM, g/l	0,92±0,04	2,65±0,05
IgA, g/l	1,89±0,08	4,26±0,12
IgG, g/l	9,10±0,27	9,61±0,09

The results obtained show that, unlike the T-lymphocyte system, the relative and absolute number of B lymphocytes (CD20+ cells) in patients was significantly higher than in healthy individuals, respectively, by an average of 1.2 and 1.6 times (P<0.05) - 22.80±0.96% and 619±26 µl in patients, against 19.42±1.39% and 379±27 µl in healthy individuals.

Practically the same results, but with greater intensity, were observed for the content of CD23+ lymphocytes in the peripheral blood of patients, the relative and absolute content of which were significantly higher than the same parameters of healthy individuals (P<0.001) - respectively, on average 19.25±1.48% versus 12.86±0.50% (1.5 times difference, P<0.001) and an average of 523±40 µl versus 251±10 µl (2.1 times difference, P<0.001).

Indicators of humoral immunity (immunoglobulins of classes M, A and G - IdM, IdA and IgG) had the same tendency and direction of changes in the examined patients as CD20+ and CD23+ cells.

The concentrations of all studied serum immunoglobulins in patients were elevated relative to the control data, only with different intensities (Figure 1).

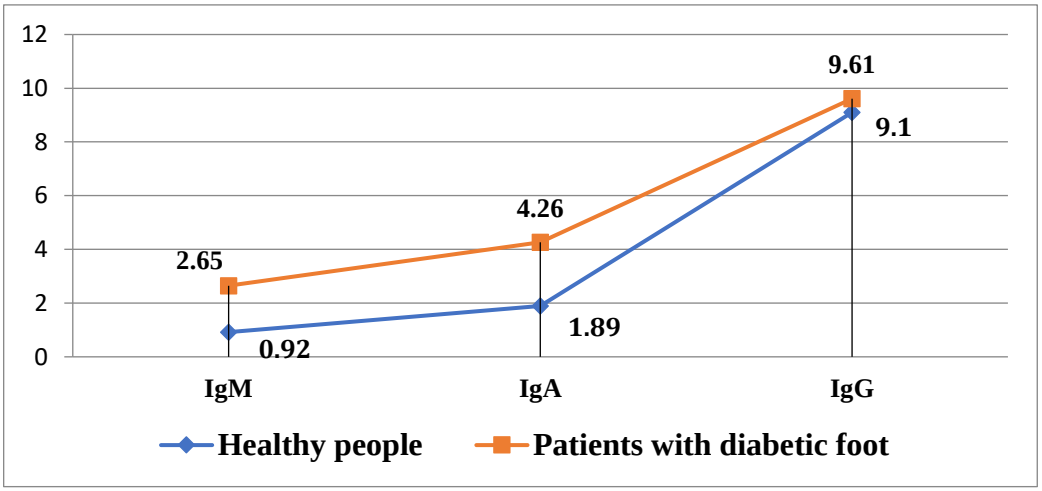


Fig.1 Comparative parameters of the content of the main classes of immunoglobulins in the blood serum of patients with DFS with signs of KINK and healthy individuals, g/l

If the indicators of IdM in patients were increased by an average of 2.9 times in relation to the data of healthy individuals (respectively 2.70±0.05 g/l versus 0.90±0.05 g/l, P<0.001), then almost the same trend was observed in the serum content of patients and healthy IdA, the difference was 2.2 times - respectively 4.20±0.11 g/l versus 1.99±0.07g/l (P<0.001). The intensity of differences between the content of IgG in the peripheral blood of the examined patients and healthy individuals was relatively low - on average 1.2 times increased in patients compared with healthy ones - respectively 9.70±0.08g/l versus 9.15±0.25 g/l (P<0.05).

Thus, the study and evaluation of the parameters of the B-lymphocyte system and humoral immunity in patients with wound infection on the background of diabetes in comparison with the data of healthy individuals showed that the relative and absolute content of CD20+ and CD23+ cells were significantly increased in patients by an average of 1.2-2.2 times relative to the control. The same trend and direction of changes were observed in the comparative analysis of the content of IdM, IdA and IgG in the blood serum of the examined patients. The greatest increase was in IdM, where the difference from healthy was 2.9 times (P<0.001), and the lowest increase in IgG, where the difference from the control data was 1.2 times (P<0.05).

Comparative characteristics of the parameters of the immune system of T- and B-lymphocyte systems showed that in the examined patients with wound infection on the background of diabetes, these indicators changed in the opposite direction - a decrease in the content of T-lymphocytes and an increase in the concentration of B-lymphocytes. This indicates the following patterns that we have identified: firstly, the studied patients have an imbalance of T- and B-lymphocyte indices; secondly, this imbalance indicates the presence of tension in the immune system of patients; Thirdly, a decrease in one component of the body's immune system causes an increase in another component of immunity, which complement each other's functions.

At the next stage of the research, the expression of some activation markers on the surface of peripheral blood lymphocytes of the studied patients with wound infection on the background of DM and healthy individuals was analyzed in comparison. In the studies, the expression features of the marker of early activation of lymphocytes, CD25+ cells, were evaluated, while the readiness of cells for apoptosis was assessed based on the determination of the expression content of CD95+ cells (Table 3).

The results showed that CD25+ cell lymphocyte markers were significantly reduced in the examined patients compared with those of healthy individuals, respectively, on average 15.33±1.19% versus 18.53±0.76% (P<0.05).

Table 3 Comparative parameters of lymphocytes with a marker of activation and apoptosis, natural killers in patients with DFS with signs of KINK and healthy individuals, M±m

Indicators	The control group	Patients with wound infection on the background of diabetes
CD25+ cells, %	18,53±0,76	15,33±1,19
CD25+ cells, µl	362±15	417±32
CD95+ cells, %	26,63±0,92	19,58±1,28
CD95+ cells, µl	520±18	527±35
CD16+ cells, %	12,70±0,50	17,82±1,01
CD16+ cells, µl	248±10	484±27

The obtained 1.2-fold difference indicates an increase in the content of lymphocytes with markers of early activation (CD25+ cells), the same pattern was observed when evaluating CD95+ cells responsible for the

readiness of cells for apoptosis - respectively, on average 19.58±1.28% versus 26.63±0.92% (1.4-fold difference, $p<0.05$

It is known that Natural killer cells (NK cells) contain the CD16+ marker on their surface and are responsible for the detection and destruction of tumor cells. Activation of these CD16+ cells indicated the presence of tension in the immune system.

Studies have found that, like lymphocytes with markers of lymphocyte activation with readiness for cell apoptosis (CD25+ and CD95+ cells), CD16+ lymphocytes were characterized by increased functional activity, that is, their content was significantly increased relative to normal values - respectively, on average 17.82±1.01% versus 12.70±0.50% (the difference is 1.4 times, $P<0.05$).

Thus, the study of lymphocytes with markers of early activation (CD25+ cells) and the readiness of cells for apoptosis (CD95+ cells), as well as natural killers (CD16+ cells) in patients with wound infection on the background of DM in comparison with healthy people showed that the content of all studied cells was significantly increased. This fact indicates that all lymphocytes are activated and the immune system is stressed.

This fact confirms that in the examined patients the inflammatory process was strongly developed, associated with a sufficient number of pathogens in the infected focus and the development of systemic inflammatory reaction syndrome (SERS) in patients, which in our opinion exacerbates the course of the pathological process, and the inflammatory process in turn leads to an aggravation of the course of wound infection. Thus, a vicious circle arises with the mutual aggravation of wound infection and the syndrome of systemic inflammatory reaction CVD.

Conclusions:

1. The study of the relative and absolute number of CD3+ cells and their regulatory subpopulations of CD4+ and CD8+ cells showed that in patients with wound infection against the background of diabetes, these parameters changed with the same tendency and multidirection, while the absolute number of cells was increased, and the relative significantly decreased relative to the control.
2. It was found that the relative and absolute content of CD20+ and CD23+ cells significantly increased in patients by an average of 1.2-2.1 times relative to the control.
3. The tendency and direction of changes to increase is observed when analyzing the content of IdM, IdA and IgG in blood serum, while IdM is most susceptible to increase, where their difference from healthy ones is 2.9 times.
4. Comparative characteristics of the parameters of the immune system of T- and B-lymphocyte systems showed that in the examined patients with wound infection on the background of diabetes mellitus, these indicators changed in opposite directions - a decrease in the content of T-lymphocytes and an increase in the concentration of B-lymphocytes.
5. During the research, the following patterns were revealed: patients have an imbalance, indicators of T- and B-lymphocytes; which indicates the presence of tension in the immune system of patients, while a decrease in one component of the body's immune system causes an increase in another component of immunity, which complement each other's functions;
6. The study of lymphocytes with markers of early activation (CD25+ cells) and the readiness of cells for apoptosis (CD95+ cells), as well as natural killers (CD16+cells) in patients with wound infection on the background of DM in comparison with healthy people showed that the content of all studied cells was significantly increased in patients. This fact indicates the development of a systemic inflammatory reaction syndrome.

Literature:

1. Al-Kanani E.S., Gostischev V.K., Yarosh A.L., Karpachev A.A., Soloshenko A.V., Zharko S.V., Linnik M.S. Treatment of purulent infection of soft tissues: from history to the present (literary review) // Actual problems of medicine. 2020. No.1. –pp.155-161
2. Arkhipov D.V., Glukhov A.A., Andreev A.A., Ostroushko A.P. Soft tissue wounds: the current state of the problem// Multidisciplinary hospital, Voronezh, 2019.-No.2.-pp.186-191.
3. Okulich V.K. Microbiological and immunological aspects of infections caused by opportunistic bacteria forming a biofilm // Bulletin of VSMU. 2016. No.5. –pp.52-57
4. Khalilov M. A., And Snimshchikova I. Studying the immune status of patients with purulent wounds against the background of local immunocorrection // VNMT. 2010. No. 1. – P.101
5. Zemskov V.M., Alekseev A.A., Kozlova M.N., Shiskina N.S.Changes in the immune system depending on the stage of burn disease and the area of thermal destruction. //Immunoglobin replacement therapy with gabriglobin. Int. J. Recent Sci. Res., 2017, Vol. 8, Iss. 2, pp. 15653-15662.
6. Akhmedov R.M., Khamdamov B.Z., Khamdamov I.B. Assessment of amputation methods at the shin level in severe forms of diabetic foot syndrome //Problems of biology and medicine. – Samarkand, 2019. №4 (113). – S.29-32.
7. Vdovich O.V., Potrokhova E.A. Prospects for the diagnostic study of interleukin 17 in rheumatoid arthritis //Diagnostic issues in pediatrics-2013.-No.4.-pp.24-27.
8. Garib F.Yu. Mechanisms of interactions of pathogenic bacteria with innate immune reactions of the host //Educational and methodical manual.- Moscow, 2012.-44c.
9. Kosaev D.V., Akhmedova L.M., Gadzhieva G.K. Monitoring of immunological parameters in patients with critical lower limb ischemia in complex treatment using laser therapy // laser medicine.-2010.-vol.14, No.1.-pp. 4-7
10. Kulikova A.N. The role of inflammation in atherogenesis in diabetes mellitus//Cytokines and inflammation.-2007.-Vol.6,No.3.-pp.14-19.
11. Lazarenko V.A., Nikolaev S.B., Bystrova N.A., Konoplya A.I. Correction of immunometabolic disorders in patients with critical lower limb ischemia of atherosclerotic genesis //Kursk Scientific and practical bulletin "Man and his health", 2010, No. 2.-pp.78-83.
12. Nuraliev N.A., Rakhmonova R.S., Ismailov B.A. Immunology. Collection of lecture texts. –Tashkent 2010.-58 p.
13. Nurgaliev N.A., Khamdamov B.Z. Comparative assessment of the immune status of patients with diabetic foot syndrome with critical lower limb ischemia. // Bulletin of the Tashkent Medical Academy. Tashkent, No. 1.- 2020. – pp. 132-138.
14. Shilova L.N., Panshina N.N., Chernov A.S., Trubenko Yu.A., Khortieva S.S., Morozova T.A., Panshin N.G. Immunopathological significance of interleukin -17 in psoriatic arthritis //Modern problems of science and education.-2015.-№6.;
15. Alhaik, Sari, Huda A. Anshasi, Ja'far Alkhawaldeh, Kim Lam Soh, and Aseel Mazen Naji. 2019. "An Assessment of Self-Care Knowledge among Patients with Diabetes Mellitus." *Diabetes and Metabolic Syndrome: Clinical Research and Reviews*. https://doi.org/10.1016/j.dsx.2018.10.010.
16. Choe, Sung Sik, Jin Young Huh, In Jae Hwang, Jong In Kim, and Jae Bum Kim. 2016. "Adipose Tissue Remodeling: Its Role in Energy Metabolism and Metabolic Disorders." *Frontiers in*

Endocrinology. https://doi.org/10.3389/fendo.2016.00030.

17. Hlinkova, Edita, Jana Nemcova, and Katarína Ziakova. 2017. "Educational Assessment of Diabetics Requiring Vascular Surgery." *Central European Journal of Nursing and Midwifery*. https://doi.org/10.15452/CEJNM.2017.08.0023.
18. Kress, S, H Anderten, A Borck, G Freckmann, L Heinemann, U Holzmueller, B Kulzer, et al. 2017. "Preulcerous Risk Situation in Diabetic Foot Syndrome - Proposal for a Simple Ulcer Prevention Scoring System." *DIABETES STOFFWECHSEL UND HERZ*.
19. Khamdamov B.Z., N.A.Nuraliev. Pathogenetic approach in complex treatment of diabetic foot syndrome with critical lower limb ischemia. //American Journal of Medicine and Medical Sciences, 2020 10 (1) 17-24 DOI: 10.5923/j.20201001.05
20. Khamdamov B.Z., Akhmedov R.M., Khamdamov A.B. The use of laser photodynamic therapy in the prevention of purulent-necrotic complications after high amputations of the lower limbs at the level of the lower leg in patients with diabetes mellitus. Scopus Preview. International journal of Pharmaceutical Research. July-Sep. Volume 11, Issue 3, 2019.https://doi.org/10.31838/ijpr/2019.11.03.089
21. Khamdamov B.Z. Indicators of immunocitocine status in purulent-necrotic lesions of the lover extremities in patients with diabetes mellitus. //American Journal of Medicine and Medical Sciences, 2020, 10 (7). -P 473-478.DOI: 10.5923/j.ajmm.20201007.08
22. Świątoniowska, Natalia, Mariusz Chabowski, and Beata Jankowska-Polańska. 2020. "Quality of Foot Care Among Patients With Diabetes: A Study Using a Polish Version of the Diabetes Foot Disease and Foot Care Questionnaire." *Journal of Foot and Ankle Surgery*. https://doi.org/10.1053/j.jfas.2019.07.020.
23. Toliver-Kinsky, Tracy, Makiko Kobayashi, Fujio Suzuki, and Edward R. Sherwood. 2018. "The Systemic Inflammatory Response Syndrome." In *Total Burn Care: Fifth Edition*. https://doi.org/10.1016/B978-0-323-47661-4.00019
24. Khamdamov B.Z.,Dehkanov A.T. Prospects for the use of silver preparations for the local treatment of wound infection // /New day in medicine. - Bukhara, 2021. - № 2 (34) 202. - C. 141-145. (14.00.00; № 22)
25. Khamdamov B.Z., Dehkanov A.T., Khamdamov A.B., Khakimboev K. A. Characteristics of the immune profile in wound infection against the background of painful diabetes mellitus // Problems of biology and medicine. - Samarkand, 2022. - № 3 (136). - C. 112-117. (14.00.00; № 19)
26. Dekhkonov A.T. Experimental development of diagnostic criteria for phases of the course of the wound process in experimental animals with diabetes mellitus.Journal ofMEDISINE and INNOVATIONS. №4(8) декабрь, 2022й. –C.97-112. (14.00.00; №12)
27. Khamdamov B.Z. Dekhkonov A.T. Gaziev K.U. Khakimboyeva K.A. Characteristics of the Immune Profile in Wound Infection in Patients with Diabetes Mellitus // American Journal of Medical Sciences 2022, 12 (4):432-436 (14.00.00; №02)
28. Khamdamov B.Z. Dekhkonov A.T. Clinical and Labaratory Parameters Of The Wound Procees Complicated by the Systemic Inflammatory Response Syndrome in Patientes With Diabetes Mellitus. Тошкент тиббиёт академияси. Journal of Educational andScientific Medicine. Issue 3 (2) 2022. – P.25-29.(14.00.00; № 01-07.3099)
29. Khamdamov B.Z., Dekhkonov A.T. Development of diagnostic criteria for wound process phases in

experemental animals with diabetes mellitus and systemic inflammatory reaction syndrome // Art of Medicine. International Medical Scientifc Journal. - 2022. April - Volume 2. Issue 3. - P. 218-234. (14.00.00; №03)

30. 30.Дехконов A.T. IMPROVTMENT OF METHODES OF LOCAL TREATMENT OF WOUND INFECTION COMPLICATED BY SYSTEMIC INFLAMMATORY SYNROME IN PATIENTS WITH DIABETES MELLITUS// // A new day in medicine. - Bukhara, 2023. - № 3 (53) - C. 107-118. (14.00.00; № 22)
31. Khamdamov B.Z. Dekhkonov A.T., Khakimboeva K.A. Characteristics of the immune profile in wound infection in patients with diabetes mellitus "Vohidov readings-2022". // Surgery of Uzbekistan №2 (94) 2022, - P. 275.
32. Khamdamov B.Z.,Dekhkonov A.T., Khamdamov A.B. Immunological profile of wound infection in patients with diabetes mellitus //LXXVI International Scientific and Practical Conference. London, United Kingdom - 2022. - P. 70-71.
33. Khamdamov B.Z., Dekhkonov A.T. Prospects for the use of silver preparations for the local treatment of wound infection // Republican scientific and practical conference on the application of highly innovative technologies in Preventive Medicine. - Andijan, 2022. – 852-853 b.
34. Dekhkonov A.T., Dadabaev O.T., Khamdamov B.Z., Radjabov D.U. Immunological profile in patients with wound infection on the background of diabetes mellitus // Republican scientific and practical conference on the application of highly innovative technologies in Preventive Medicine. - Andijan, 2022. – 583-584 p.
35. Dekhonov A.T., Khamdamov B.Z. Preparations of silver ions for local treatment of wound infection // Scientific and practical injuman dedicated to the 130th anniversary of the Multidisciplinary Medical Center of the Bukhara region on the topic of current problems of modern medicine and their solution.- Bukhara 2021, 78-80 p.
36. Hamdamov B.Z., Dekhkonov A.T. Development end comparative analysis of the effectiveness of methods of local treatment of wound infection complicated by systemic inflammatory reaction syndrome in patients with diabetes mellitus//XXX international scientific specialized conference international scientific revien of the problems of natural sciences medicine. Boston, USA. January 2023, 98-102 b.