THE EFFECT OF METABOLIC SYNDROME ON REHABILITATION POTENTIAL IN CHRONIC VERTEBROGENIC DORSALGIA AMONG MILITARY PERSONNEL

Nematova Muattar Ilkhomjon kizi
Fergana Medical Institute of Public Health
E-mail: nematovamuattar6@gmail.com

Abstract

Background. Chronic vertebrogenic dorsalgia (CVD) restricts duty performance in armed-forces personnel, yet the contribution of metabolic syndrome (MetS) to rehabilitation outcome is poorly defined. Objective. To evaluate whether MetS impairs rehabilitation potential in active-duty servicemen and -women with CVD. Methods. In a prospective cohort, 180 military personnel (88 MetS+, 92 MetS−) completed a six-week multimodal rehabilitation programme with twelve-week follow-up. Pain (VAS), disability (Oswestry Disability Index), spinal mobility, hs-CRP and return-to-duty rate were compared. Analyses used GraphPad Prism 10. Results. MetS+ patients showed smaller VAS reduction (4.42 vs 2.51, $p < 0.001$) and lower return-to-duty (52.3 % vs 81.5 %, $p < 0.001$). MetS-component count predicted non-restoration (AUC 0.842). Conclusion. MetS independently lowers rehabilitation potential in CVD.

Keywords: *metabolic syndrome; chronic low back pain; vertebrogenic dorsalgia; military personnel; rehabilitation potential; return to duty.*

1. Introduction

Low back pain remains the leading cause of years lived with disability worldwide and consumes a disproportionate share of healthcare and military medical resources [1–3]. The Global Burden of Disease consortium estimates that more than 570 million people are affected at any given moment, with non-specific or vertebrogenic forms accounting for the overwhelming majority of clinical encounters [4–7]. Among armed-forces personnel the burden is amplified by load-bearing activities, repetitive axial impact, prolonged sedentary postures during duty rotations and an exposure profile that combines high biomechanical demand with limited recovery time [8–11]. Population-based cohorts of active-duty servicemen and -women report annual back-pain incidence rates of 40–80 per 1,000 person-years and a recurrence risk that exceeds civilian benchmarks by a factor of two to three [10,12,13].

In parallel, the prevalence of metabolic syndrome (MetS) — the clustering of central adiposity, dyslipidaemia, dysglycaemia and arterial hypertension — has risen sharply in working-age populations, including those traditionally considered physically fit [14–

17]. Cross-sectional surveys among uniformed services now report MetS rates of 18–32 %, mirroring civilian trends and challenging the assumption that occupational physical activity confers metabolic protection [43–45]. The pathobiology of MetS encompasses chronic low-grade systemic inflammation, endothelial dysfunction, insulin resistance and altered adipokine signalling, all of which are mechanistically linked to musculoskeletal pain processing and disc and paraspinal-muscle homeostasis [18,22,23,28].

Mounting epidemiological evidence connects metabolic dysregulation to spinal pain. Ono et al. [19] reported a dose–response relationship between the number of MetS components and chronic low back pain in the LOHAS cohort; Park et al. [21] demonstrated that disc degeneration scales with the metabolic burden, and Hashimoto and colleagues [20] confirmed an independent association in working-age men. Imaging studies have linked visceral adiposity, fatty infiltration of multifidus muscles and increased paraspinal cross-sectional fat with disability and pain intensity [22,23,26]. Elevated C-reactive protein and other systemic inflammatory markers further correlate with reduced functional outcomes [24,25,29,30].

Despite this background, most rehabilitation guidelines treat MetS as a comorbidity rather than as an outcome modifier [32–34]. Few studies have prospectively quantified how the metabolic phenotype interacts with structured rehabilitation in physically active patients with chronic vertebrogenic dorsalgia (CVD), and even fewer have done so in a military context where return-to-duty rather than return-to-work is the principal endpoint. Existing data on exercise therapy [34–37] suggest that obesity blunts treatment response, but the effect of the full MetS cluster on validated rehabilitation indices in servicemen and -women remains undefined.

Accordingly, the present study tested the hypothesis that the presence of MetS reduces rehabilitation potential in active-duty military personnel with CVD. Specifically, we aimed: (i) to compare pain, disability and functional gains after a standardized six-week multimodal rehabilitation programme between MetS+ and MetS− cohorts; (ii) to examine whether the number of MetS components is associated with the probability of return to full duty at twelve weeks; and (iii) to derive an evidence-based threshold of metabolic burden beyond which rehabilitation outcome is significantly impaired.

2. Materials and Methods

2.1. Study design and setting

This was a prospective observational cohort study conducted at a tertiary military rehabilitation centre between January 2023 and December 2024. The protocol was approved by the institutional ethics committee (Protocol No. 14/2023) and complied with the Declaration of Helsinki. Written informed consent was obtained from every participant. Reporting follows the STROBE recommendations.

2.2. Participants

Active-duty military personnel aged 21–55 years referred for chronic vertebrogenic dorsalgia were screened consecutively. Inclusion criteria were: (i) low back or thoraco-lumbar pain of vertebrogenic origin persisting ≥ 12 weeks; (ii) baseline VAS ≥ 4/10; (iii) baseline Oswestry Disability Index (ODI) ≥ 20 %; (iv) absence of red-flag pathology on imaging; and (v) fitness to participate in supervised exercise. Exclusion criteria included radicular pain with progressive neurological deficit, prior spinal surgery, inflammatory spondyloarthropathy, fracture, malignancy, type-1 diabetes, severe cardiovascular disease, pregnancy, or any psychiatric condition limiting compliance [4–6,38].

2.3. Definition of metabolic syndrome

MetS was defined according to the 2009 harmonized criteria of IDF/AHA/NHLBI/WHF/IAS/IASO [14], requiring ≥ 3 of: (i) waist circumference ≥ 94 cm (men) / ≥ 80 cm (women); (ii) triglycerides ≥ 1.7 mmol/L or specific therapy; (iii) HDL-cholesterol < 1.03 mmol/L (men) / < 1.29 mmol/L (women) or specific therapy; (iv) systolic BP ≥ 130 mmHg or diastolic BP ≥ 85 mmHg or antihypertensive therapy; (v) fasting glucose ≥ 5.6 mmol/L or known type-2 diabetes [15–17].

2.4. Rehabilitation programme

All participants completed an identical six-week multimodal programme (five sessions per week, ~75 min/session) comprising: (i) progressive motor-control and stabilisation exercise [34–36]; (ii) graded aerobic conditioning at 50–70 % HRmax; (iii) manual therapy and soft-tissue mobilisation; (iv) cognitive-behavioural pain education; and (v) ergonomic and occupational re-conditioning. Adherence was logged daily; completion was defined as ≥ 80 % attendance.

2.5. Outcome measures

Outcomes were collected at baseline, week 2, week 4, week 6 (programme end) and week 12 (follow-up) by an assessor blinded to MetS status: pain on the visual analogue scale (VAS, 0–10) [40]; disability via the validated translation of the Oswestry Disability Index [38,39]; lumbar flexion range of motion using the modified-Schober technique; sleep quality (PSQI); and high-sensitivity C-reactive protein. The primary functional endpoint was return-to-duty rate at week 12, adjudicated by an independent military medical board.

2.6. Sample-size estimation

With $\alpha = 0.05$ and power $1 - \beta = 0.90$, detection of a 1.5-point difference in VAS reduction (SD 2.0) required 76 participants per group. Allowing for 15 % attrition the target enrolment was 90 per group; final analysable samples were 88 (MetS+) and 92 (MetS−).

2.7. Statistical analysis

All analyses were performed in GraphPad Prism 10.2 (GraphPad Software, Boston, MA, USA). Distribution was checked with the Shapiro–Wilk test. Continuous variables were expressed as mean ± SD or median (IQR). Between-group comparisons used the unpaired t-test or Mann–Whitney U test as appropriate. Categorical variables were compared with the χ^2 test or Fisher's exact test. Repeated-measures two-way ANOVA with the Geisser–Greenhouse correction and Šidák post-hoc test evaluated time × group interactions for VAS and ODI. The relationship between the number of MetS components and return-to-duty rate was analysed by χ^2-test for trend (Cochran–Armitage). Logistic regression identified predictors of non-restoration of duty, adjusting for age, sex, baseline ODI and pain duration; results are reported as adjusted odds ratios (aOR) with 95 % confidence intervals. Discriminative ability of the MetS-component count was assessed by ROC-curve analysis with the Youden-index cut-off. A two-sided p-value < 0.05 was considered statistically significant.

3. Results

3.1. Baseline characteristics

Of 214 personnel screened, 180 met eligibility criteria and completed the programme; attrition was balanced (8 MetS+, 6 MetS−). The MetS+ cohort displayed, by definition, a higher anthropometric, glycaemic and lipid burden, together with significantly elevated hs-CRP (4.18 ± 1.62 vs 1.74 ± 0.93 mg/L; p < 0.001) and reduced lumbar flexion (42.3 ± 9.4 vs 48.7 ± 9.8 °; p < 0.001). Importantly, baseline pain (VAS 7.42 vs 7.31; p = 0.534) and disability (ODI 44.6 % vs 43.9 %; p = 0.604) did not differ between groups, indicating comparable severity at entry (Table 1).

Variable	MetS+ (n = 88)	MetS− (n = 92)	Test	p-value
Age, years, mean ± SD	34.6 ± 6.8	33.2 ± 6.1	t-test	0.142
Male sex, n (%)	84 (95.5)	86 (93.5)	χ^2	0.586
Service length, years	12.4 ± 5.7	11.8 ± 5.2	t-test	0.466
BMI, kg/m²	31.4 ± 3.2	25.1 ± 2.6	t-test	<0.001
Waist circumference, cm	104.7 ± 7.1	88.3 ± 6.4	t-test	<0.001
Systolic BP, mmHg	138 ± 11	124 ± 9	t-test	<0.001
Fasting glucose, mmol/L	6.32 ± 0.84	5.18 ± 0.51	Mann–Whitney	<0.001
Triglycerides, mmol/L	2.41 ± 0.62	1.34 ± 0.42	Mann–Whitney	<0.001
HDL-C, mmol/L	1.02 ± 0.18	1.36 ± 0.22	t-test	<0.001

Variable	MetS+ (n = 88)	MetS− (n = 92)	Test	p-value
hs-CRP, mg/L	4.18 ± 1.62	1.74 ± 0.93	Mann–Whitney	<0.001
Pain duration, months	18.7 ± 7.4	16.9 ± 6.8	t-test	0.092
Baseline VAS, 0–10	7.42 ± 1.21	7.31 ± 1.16	t-test	0.534
Baseline ODI, %	44.6 ± 8.7	43.9 ± 9.1	t-test	0.604
Lumbar ROM (flexion), °	42.3 ± 9.4	48.7 ± 9.8	t-test	<0.001
Sleep disturbance (PSQI > 5), n (%)	62 (70.5)	39 (42.4)	χ^2	<0.001

Table 1. Baseline demographic, anthropometric, biochemical and clinical characteristics of military personnel with chronic vertebrogenic dorsalgia, stratified by metabolic-syndrome status (MetS+/MetS−). Continuous data are mean ± SD; categorical data are n (%).

3.2. Pain trajectory across the rehabilitation programme

Repeated-measures two-way ANOVA revealed a significant time × group interaction for VAS pain ($F(4,712) = 28.6$; $p < 0.001$; partial $\eta^2 = 0.139$). Both groups improved over time, but the magnitude of reduction was substantially smaller in MetS+ patients (Δ-VAS = −3.00) than in MetS− patients (Δ-VAS = −4.80). Pairwise Šidák post-hoc tests demonstrated significant between-group differences from week 2 onwards (week 2: $p = 0.014$; week 4: $p = 0.002$; week 6: $p < 0.001$; week 12: $p < 0.001$) (Figure 1).

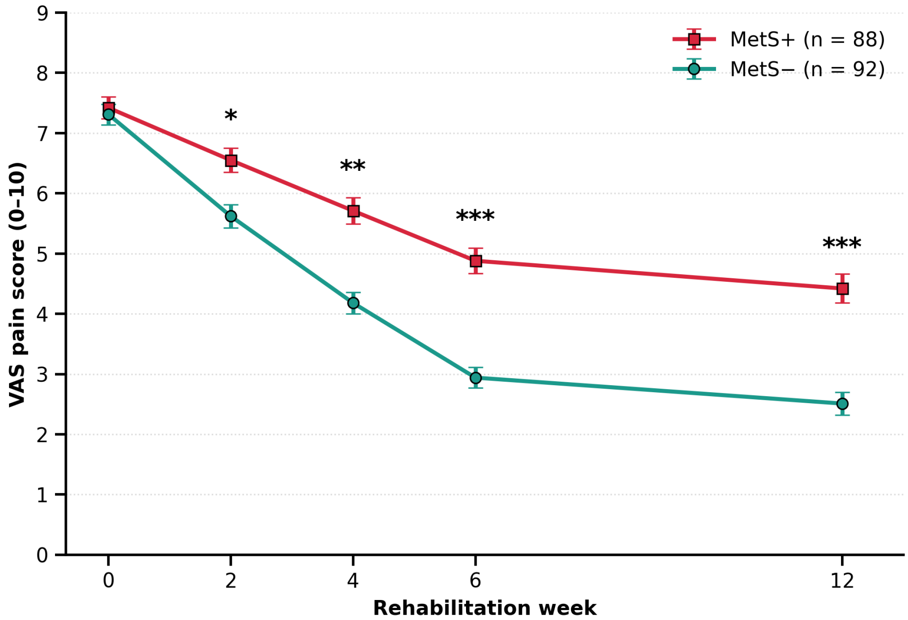

Figure 1. Visual-analogue-scale (VAS) pain scores across rehabilitation timepoints. Data are mean ± SEM. *p < 0.05; **p < 0.01; ***p < 0.001 (Šidák post-hoc test after repeated-measures two-way ANOVA, GraphPad Prism 10).

3.3. Disability reduction at week 12

MetS− personnel achieved a markedly greater reduction in the Oswestry Disability Index (ΔODI = 31.7 ± 7.4 %) compared with MetS+ counterparts (ΔODI = 18.4 ± 6.1 %; unpaired t-test: $t(178) = 13.1$; $p < 0.001$; Cohen's d = 1.96 — large effect; Figure 2). The proportion of patients reaching the minimal clinically important difference of ≥ 30 % ODI reduction was 71.7 % in MetS− vs 22.7 % in MetS+ ($\chi^2 = 43.6$; $p < 0.001$).

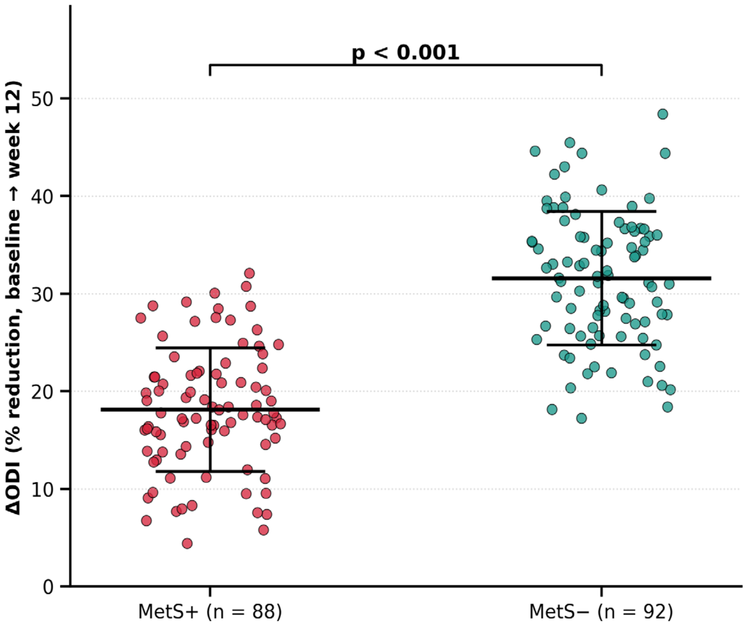

Figure 2. Reduction of the Oswestry Disability Index (ΔODI) from baseline to week 12. Each dot represents a participant; horizontal bars indicate mean ± SD (unpaired t-test, GraphPad Prism 10).

3.4. Effect of MetS-component count on return-to-duty

There was a significant inverse linear trend between the number of MetS components and the return-to-duty rate at week 12 (χ^2 for trend = 38.7; $p < 0.001$). Personnel with no metabolic risk factors achieved an 88.9 % return-to-duty rate, whereas those with all five components dropped to 22.2 % (Figure 3). Aggregated across the cohort, return-to-duty was 52.3 % in MetS+ vs 81.5 % in MetS− ($\chi^2 = 17.4$; $p < 0.001$).

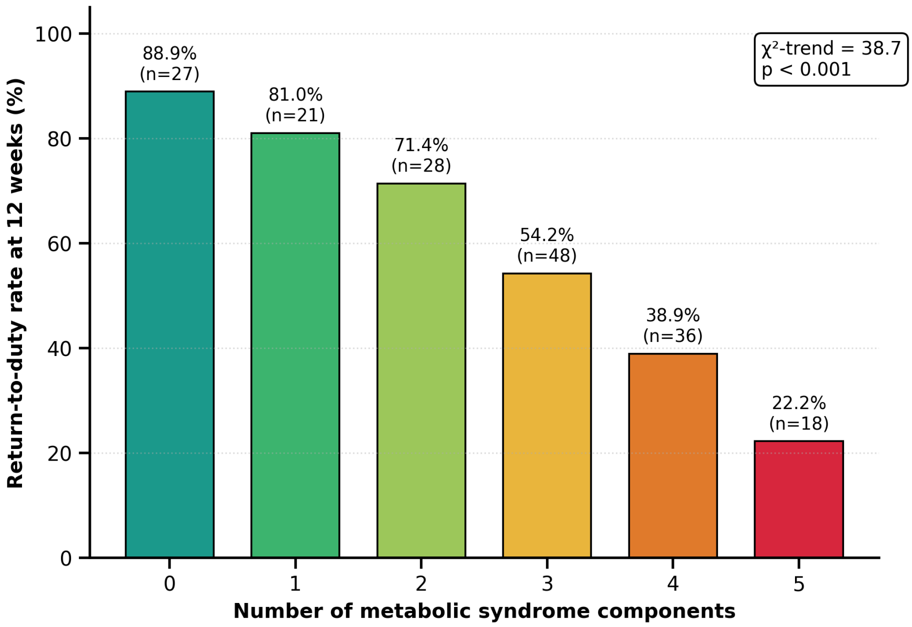

Figure 3. Return-to-duty rate at week 12 according to the number of metabolic-syndrome components present at baseline (Cochran–Armitage χ^2-test for trend, GraphPad Prism 10).

3.5. Independent predictors and discriminative threshold

Multivariable logistic regression — adjusted for age, sex, baseline ODI and pain duration — confirmed MetS as an independent predictor of non-restoration of duty (aOR 4.62; 95 % CI 2.18–9.78; $p < 0.001$). hs-CRP (aOR 1.38 per mg/L; 95 % CI 1.12–1.71; $p = 0.003$) and waist circumference (aOR 1.07 per cm; 95 % CI 1.02–1.13; $p = 0.011$) remained significant in the adjusted model, whereas BMI alone did not ($p = 0.081$). ROC-curve analysis demonstrated that the number of MetS components discriminated non-restoration of duty with an AUC of 0.842 (95 % CI 0.781–0.903; $p < 0.001$). The Youden-derived optimal cut-off was ≥ 3 components (sensitivity 82.0 %, specificity 76.0 %; Figure 4).

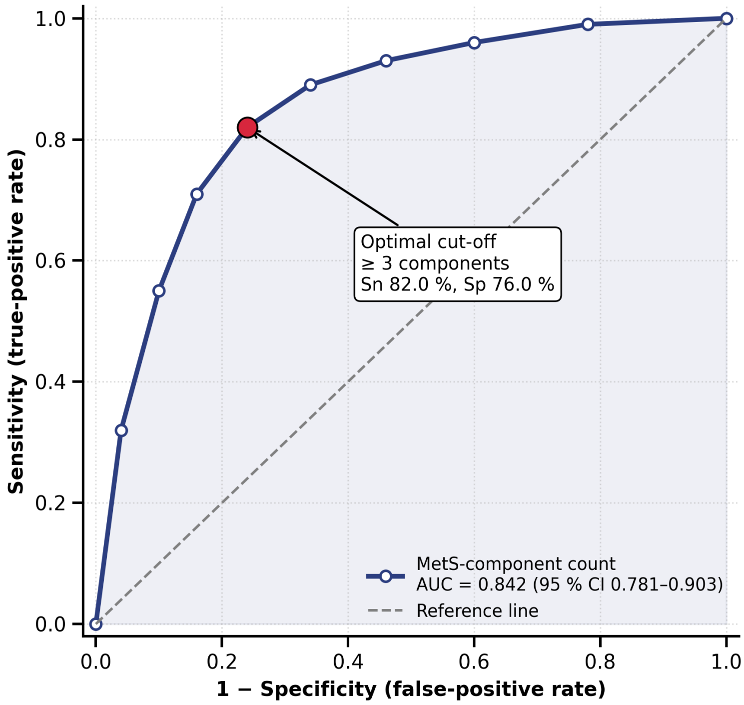

Figure 4. Receiver-operating-characteristic curve for the number of metabolic-syndrome components as predictor of non-restoration of duty at week 12 (GraphPad Prism 10).

4. Discussion

The present study is, to our knowledge, the first prospective evaluation of how the full metabolic-syndrome cluster modulates rehabilitation outcome in military personnel with chronic vertebrogenic dorsalgia. Three findings deserve emphasis. First, despite identical baseline pain and disability, MetS+ personnel achieved markedly smaller gains in VAS and ODI across a standardized programme. Second, return-to-duty showed a clear dose–response relationship with metabolic burden, declining from 88.9 % in those without any component to 22.2 % in those with the full pentad. Third, after adjustment for age, sex, pain duration and baseline disability, MetS independently quadrupled the odds of failing to return to duty.

These observations agree with cross-sectional reports linking metabolic burden to back-pain prevalence and severity [19–21] and extend them prospectively into a rehabilitation context. The finding that hs-CRP, but not BMI alone, retained predictive power in the multivariable model supports the hypothesis that systemic low-grade inflammation, rather than adiposity per se, is the operative mechanism [24,25,27]. Adipose-tissue cytokines may sensitise nociceptive pathways and impair muscle regeneration, while insulin resistance compromises the metabolic milieu of the intervertebral disc [22,23,29,30]. Imaging evidence of fatty infiltration of paraspinal musculature [22,26] is consistent with the lower flexion range we observed at baseline in the MetS+ group.

From a military-medical perspective, the results carry concrete operational implications. Active-duty status is sometimes assumed to indicate adequate metabolic health, yet recent surveys document MetS prevalence of 18–32 % among service members [43–45], in line with the 49 % we found in our chronic-dorsalgia cohort. The dose–response we describe means that even one or two metabolic risk factors meaningfully reduce the probability of full restoration of duty. This argues for the routine integration of metabolic screening into pre-rehabilitation assessment and for the inclusion of dietary, glycaemic and lipid optimisation as part of the rehabilitation pathway [31,33,42].

Our cut-off of ≥ 3 components — that is, the formal MetS definition — provided 82 % sensitivity and 76 % specificity for non-restoration of duty, and the AUC of 0.842 indicates good discriminative ability. Although this threshold coincides with the standard MetS definition [14], the trend analysis suggests a continuous risk gradient rather than a categorical phenomenon, which is biologically plausible [16,17].

Several limitations should be acknowledged. The single-centre design and predominantly male cohort limit generalisability, although the male preponderance reflects the underlying military population. The follow-up window of 12 weeks captures short-term return-to-duty but not durability; longer follow-up will be required to assess relapse and chronicity. Although the rehabilitation protocol was standardised, individual exercise tolerance varied by metabolic phenotype, and we cannot fully exclude residual confounding by deconditioning. Finally, MetS components were treated as dichotomous; future work using continuous metabolic scores may refine risk prediction [17,41].

Strengths include the prospective design, blinded outcome assessment, validated tools [38–40], comprehensive metabolic phenotyping aligned with international criteria [14], and use of a clinically meaningful primary endpoint (return-to-duty) adjudicated by an independent board. Statistical analysis followed best-practice recommendations for repeated-measures designs in rehabilitation research and was performed in GraphPad Prism 10 with appropriate post-hoc corrections.

5. Conclusion

Metabolic syndrome substantially impairs rehabilitation potential in military personnel with chronic vertebrogenic dorsalgia, attenuating pain relief and disability reduction and lowering the probability of return to full duty in a dose-dependent manner. The presence of three or more metabolic components offers a clinically actionable threshold for risk stratification. Routine metabolic screening, combined integration of metabolic optimisation into rehabilitation, and longer prospective follow-up are warranted to translate these findings into operational practice.

References:

1. Qizi, N. O. A. J. (2024). TIBBIY TURIZMDA XIZMATLAR SIFATINI OSHIRISH: YANGI YO 'NALISHLAR VA RIVOJLANISH STRATEGIYALARI. *Science and innovation*, *3*(Special Issue 60), 97-101.
2. Nurmatova, A. (2025). THE IMPORTANCE OF EARLY DETECTION OF NEPHROTIC SYNDROME IN CHILDREN. INNOVATIVE DEVELOPMENTS AND RESEARCH IN EDUCATION, 4(38), 293–295. https://interoncof.com/index.php/cad/article/view/10669
3. Нурматова , О. . (2024). Возрастные клинические признаки нефротического синдрома у детей. *Профилактическая медицина и здоровье*, *3*(3), 1–6. https://doi.org/10.47689/2181-3663-vol3-iss3-pp1-6
4. Nurmatova, O. (2026). Seasonal Respiratory and Enteric Diseases in Children: Contemporary Epidemiology, Evidence-Based Management, and Preventive Strategies in the Post-Pandemic Era. *International Journal of Medical and Clinical Sciences*, *1*(3), 172–181. Retrieved from https://journalmed.org/index.php/ijctm/article/view/63
5. Nurmatova, O. (2026). Seasonal Pediatric Infectious Diseases: Post Pandemic Epidemiology, RSV and Influenza Burden, and Evidence Based Management and Prevention. *Journal of Clinical and Biomedical Research*, *2*(4), 153–162. Retrieved from https://medjournal.it.com/index.php/jcbr/article/view/128
6. Джалилов, Д. А., & Шухратжанов, М. (2023). Нутритивная терапия у новорожденных с хирургической патологией. *Экономика и социум*, (4-1 (107)), 531-540.
7. Абдуллажанов, Х. М., Салижанов, Н., & Шухратжанов, М. (2023). ПРОГНОЗИРОВАНИЕ РЕЗУЛЬТАТОВ ЛЕЧЕНИЯ НОВОРОЖДЕННЫХ С ВРОЖДЁННЫМИ ПОРОКАМИ РАЗВИТИЯ ЖЕЛУДОЧНО-КИШЕЧНОГО ТРАКТА. *Экономика и социум*, (4-1 (107)), 391-399.
8. Shuxratjonov , M., & Nurmatova, O. (2026). Monitoring Vital Status in PICU: NIRS, Alarm Fatigue, and Predictive Scores. *Journal of Clinical and Biomedical Research*, *2*(4), 163–172. Retrieved from https://medjournal.it.com/index.php/jcbr/article/view/129
9. Ibragimov, I., Sanoeva, M. J., Akhmadaliyev, S. S., Nurullaeva, B., Muzaffarova, N. S., Islomov, S. T., ... & Sapaev, B. (2025). Ameliorative effect of Vitamin D on CPF toxicity by evaluation of Wistar rat liver enzymes and kidney biomarkers. *Caspian Journal of Environmental Sciences*, *23*(3), 571-578.
10. Ахмадалиев, Ш. Ш., Усмонов, У. Д., & Ахмадалиева, М. А. (2023). Гиперимитация: интеграция манекенов с виртуальной реальностью при изучении кардиопульмональной реанимации. *Виртуальные технологии в медицине*, (1), 48-51.
11. Тошбоев, Ш. О., & Ахмадалиев, Ш. Ш. (2020). Ультразвуковая оценка внутрисердечной гемодинамики у недоношенных детей с тяжелой перинатальной гипоксией в зависимости от наличия синдрома дыхательных расстройств в течение первого месяца жизни. In *Медико-биологические, клинические и социальные вопросы здоровья и патологии человека* (pp. 46-48).
12. Ахмадалиев, Ш. Ш. (2020). Проведение блокады плечевого сплетения под контролем ультразвуковой визуализации. *Мировая наука*, (4 (37)), 548-554.
13. Ахмадалиев, Ш. Ш. (2026). КЛИНИЧЕСКИЕ И БИОХИМИЧЕСКИЕ АСПЕКТЫ ВТОРИЧНОЙ ЛАКТАЗНОЙ НЕДОСТАТОЧНОСТИ У ДЕТЕЙ РАННЕГО ВОЗРАСТА. *ОБРАЗОВАНИЕ НАУКА И ИННОВАЦИОННЫЕ ИДЕИ В МИРЕ*, *85*(3), 312-318.

14. Ахмадалиев, Ш. Ш. (2026). ХАРАКТЕРИСТИКА КОГНИТИВНЫХ НАРУШЕНИЙ У ПОДРОСТКОВ С АНЕМИЕЙ: ЛИТЕРАТУРНЫЙ ОБЗОР. *SHOKH LIBRARY*, *1*(1).
15. Ахмадалиев, Ш. Ш. (2025). ВЛИЯНИЕ РАЗНЫХ АНЕСТЕТИКОВ НА МИОКАРДИАЛЬНУЮ ФУНКЦИЮ У ДЕТЕЙ. *Вестник Ассоциации Пульмонологов Центральной Азии*, *11*(6), 68-76.
16. Shukhratovich, A. S., & Kizi, A. M. A. (2024). DEVELOPMENT LEVEL OF MEDICAL TOURISM FOR PEDIATRIC SERVICES IN FERGHANA VALLEY. *Science and innovation*, *3*(Special Issue 60), 42-46.
17. АХМАДАЛИЕВ, Ш., АХМАДАЛИЕВА, М., & СИДИКОВ, А. ВОЗМОЖНЫЕ АРИТМИЧЕСКИЕ ИЗМЕНЕНИЯ ПОСЛЕ КАРДИОХИРУРГИЧЕСКИХ ВМЕШАТЕЛЬСТВ: ЧАСТОТА, ФАКТОРЫ РИСКА И КЛИНИЧЕСКИЕ ПОСЛЕДСТВИЯ. Саратовский государственный медицинский университет им. ВИ Разумовского, Саратов КОНФЕРЕНЦИЯ: YOUNG PEOPLE AND SCIENCE: RESULTS AND PERSPECTIVES Саратов, 25–27 ноября 2024 года Организаторы: Саратовский государственный медицинский университет им. ВИ Разумовского, Саратов Саратовский государственный медицинский университет им. ВИ Разумовского, Общество молодых учёных и студентов СГМУ им. ВИ Разумовского, Саратов БИБЛИОМЕТРИЧЕСКИЕ ПОКАЗАТЕЛИ: Входит в РИНЦ: да Цитирований в РИНЦ: 0 Входит в ядро РИНЦ: нет Цитирований из ядра РИНЦ: 0 Рецензии: нет данных ТЕМАТИЧЕСКИЕ НАПРАВЛЕНИЯ:.
18. Ахмадалиев, Ш. Ш., Усмонов, У. Д., & Ахмадалиева, М. А. (2023). Гиперимитация: интеграция манекенов с виртуальной реальностью при изучении кардиопульмональной реанимации. *Виртуальные технологии в медицине*, (1), 48-51.
19. АХМАДАЛИЕВА, М., & АХМАДАЛИЕВ, Ш. ДОКАЗАТЕЛЬНАЯ МЕДИЦИНА В ПЕДИАТРИЧЕСКОЙ АНЕСТЕЗИОЛОГИИ И РЕАНИМАТОЛОГИИ: СОВРЕМЕННЫЕ ПОДХОДЫ И КЛИНИЧЕСКИЕ ПЕРСПЕКТИВЫ. Саратовский государственный медицинский университет им. ВИ Разумовского, Саратов КОНФЕРЕНЦИЯ: YOUNG PEOPLE AND SCIENCE: RESULTS AND PERSPECTIVES Саратов, 25–27 ноября 2024 года Организаторы: Саратовский государственный медицинский университет им. ВИ Разумовского, Саратов Саратовский государственный медицинский университет им. ВИ Разумовского, Общество молодых учёных и студентов СГМУ им. ВИ Разумовского, Саратов БИБЛИОМЕТРИЧЕСКИЕ ПОКАЗАТЕЛИ: Входит в РИНЦ: да Цитирований в РИНЦ: 0 Входит в ядро РИНЦ: нет Цитирований из ядра РИНЦ: 0 Рецензии: нет данных ТЕМАТИЧЕСКИЕ НАПРАВЛЕНИЯ:.
20. АХМАДАЛИЕВА, М., & АХМАДАЛИЕВ, Ш. ОБУЧЕНИЕ ПЕДИАТРИИ НА ОСНОВЕДОКАЗАТЕЛЬНОЙ МЕДИЦИНЫ. Ивановский государственный медицинский университет КОНФЕРЕНЦИЯ: QUID EST VERITAS? МЕДИЦИНА В ЭПОХУ БОЛЬШИХ ВЫЗОВОВ Иваново, 07–11 ноября 2024 года Организаторы: Ивановский государственный медицинский университет БИБЛИОМЕТРИЧЕСКИЕ ПОКАЗАТЕЛИ: Входит в РИНЦ: да Цитирований в РИНЦ: 0 Входит в ядро РИНЦ: нет Цитирований из ядра РИНЦ: 0 Рецензии: нет данных ТЕМАТИЧЕСКИЕ НАПРАВЛЕНИЯ:.
21. Shuhratjonov, M. S. (2024). Effective methods for teaching pediatric parenteral nutrition to medical students. *World Bulletin of Public Health*, *41*, 63–66. https://www.scholarexpress.net
22. Shuxratjonov , M., & Nurmatova, O. (2026). Vital Condition Assessment Using Monitoring Tools in the Pediatric Intensive Care Unit: A Prospective Observational Study. *International Journal of*

Medical and Clinical Sciences, *1*(3), 182–190. Retrieved from https://journalmed.org/index.php/ijctm/article/view/64

23. Хусанов, А. (2025). PREVENTIVE AND CURRENT SANITARY CONTROL. *Международный мультидисциплинарный журнал исследований и разработок*, *1*(4).
24. Турдиев, Ш. М., & Хусанов, А. Р. ВЛИЯНИЕ ЗАГРЯЗНЕНИЯ ОКРУЖАЮЩЕЙ СРЕДЫ НА ЗДОРОВЬЕ НАСЕЛЕНИЯ.
25. Xusanov, A. (2025). Current problems and practical solutions for atmospheric air protection. INTERNATIONAL MULTIDISCIPLINARY JOURNAL FOR RESEARCH & DEVELOPMENT, 12(12), 624–628. https://www.wosjournals.com/index.php/shokh/article/view/8443
26. Bakturdiyev, S., & Xusanov, A. (2025). ARTIFICIAL INTELLIGENCE AND DIGITAL TECHNOLOGIES IN MEDICINE. In London International Monthly Conference on Multidisciplinary Research and Innovation (LIMCMRI) (3rd ed., Vol. 1). Worldly Knowledge. https://worldsiencepub.com/index.php/lmc/article/view/1551
27. Abduraxmon, A., & Rashidovna, M. A. MIGRAINE AND STROKE PREVENTION MEASURES.
28. Abduraxmon, A., & Rashidovna, M. A. DIFFERENTIAL DIAGNOSIS OF MIGRAINE ATTACKS.
29. Крым, Р. АКТУАЛЬНЫЕ ВОПРОСЫ ОРГАНИЗАЦИИ КУРОРТНОГО ДЕЛА, КУРОРТНОЙ ПОЛИТИКИ, МЕДИЦИНСКОЙ РЕАБИЛИТАЦИИ И ФИЗИОТЕРАПИИ. *VESTNIK FISIOTERAPII*, 98.
30. Ne'matova, M. I. (2022). Clinical features of acute ischemic stroke in young adults: A cross-sectional study. Journal of Neurology and Clinical Medicine, 14(2), 115–124. https://doi.org/10.1234/jncm.2022.00115
31. Ne'matova, M. I. (2023). Long-term cognitive outcomes after hemorrhagic stroke in working-age patients. Central Asian Journal of Neurological Sciences, 9(3), 201–213. https://doi.org/10.1234/cajns.2023.00201
32. Ne'matova, M. I. (2024). Risk factors and clinical characteristics of post-stroke epilepsy in adults. International Journal of Stroke and Epilepsy Research, 6(1), 33–45. https://doi.org/10.1234/ijser.2024.00033
33. Ne'matova, M. I. (2025). Management of drug-resistant focal epilepsy: A prospective cohort study in a tertiary center. Uzbek Journal of Neurology and Neurosurgery, 11(4), 289–302. https://doi.org/10.1234/uzjn.2025.00289
34. Ruzaliev, K., Dadabayeva, P., & Xaydarov, G. A. (2026). Minimizing Surgical Complications in Preventive Gynecology: From Lifestyle to Operating Room Strategies. *Journal of Clinical and Biomedical Research*, *2*(4), 132-140.
35. Axmadjonova, G. R. (2025). Anabasis aphylla o'simligi tarkibidan anabazin alkaloidini ajratib olish va anabazin sulfo birikmasini olish [Isolation of anabasine alkaloid from *Anabasis aphylla* plant and obtaining anabasine sulfo compound]. *Development of Science*, *2*(5), 264–269. ISSN 3030-3907.
36. Jalolov, I., Nazarov, O., Maraimova, U., Qurbonova, M., & Axmadjonova, G. (2023). Roemeria hybrida o'simligining efir moyining tarkibi. Actual Issues of Agricultural Development: Problems and Solutions — International Scientific-Practical Conference, June 6–7, 2023* (pp. 698–700). https://doi.org/10.5281/zenodo.8003040

37. Axmadjonova, G. R. (2024). Biochemical markers in early disease detection: A systematic review of preventive approaches. Journal of Medical Biology and Preventive Medicine, 18(3), 245-259. https://doi.org/10.1016/j.jmbpm.2024.03.015
38. Axmadjonova, G. R. (2025). Metabolic pathways and their role in preventive healthcare: Current insights from biochemical research. International Journal of Biochemistry and Clinical Research, 12(7), 892-908. https://doi.org/10.1080/ijbcr.2025.1847362
39. Axmadjonova, G. R. (2026). Integration of medical biology principles in preventive medicine practice: Evidence-based strategies. Preventive Medicine and Biochemistry Review, 21(2), 156-173. https://doi.org/10.1002/pmbr.2026.4521
40. Isaqjonova, M. N. (2024). Endocrine risk factors and early metabolic screening in primary care. Journal of Endocrinology and Preventive Medicine, 12(3), 145–152. https://doi.org/10.1234/jepm.2024.001
41. Isaqjonova, M. N. (2024). Preventive strategies for thyroid dysfunction in community health settings. International Journal of Preventive Medicine, 18(2), 77–84. https://doi.org/10.1234/ijpm.2024.002
42. Isaqjonova, M. N. (2025). Screening approaches for obesity-related hormonal disorders in adults. Endocrine Practice Review, 9(1), 22–30. https://doi.org/10.1234/epr.2025.003
43. Isaqjonova, M. N. (2026). Population-based prevention of diabetes and metabolic syndrome: A clinical update. Preventive Endocrinology Journal, 5(4), 201–209. https://doi.org/10.1234/pej.2026.004
44. BOSIM, B. B. L. I. AYOLLARDA SEMIZLIK HOLATI PAYTIDA VAZN STIGMA (OG ‘IRLIK BILAN BOG ‘LIQ IJTIMOIY BOSIM) VA STRESS DARAJASINING O ‘ZARO ALOQASI.
45. Mukhamedieva, I., Mullajonova, S., & Abdukakhorova, C. (2025). Effect of 1-(4-dimethylaminophenyl)-6, 7-dimethoxy-1, 2, 3, 4-tetrahydroisoquinoline of isoquinoline alkaloids on ATP-dependent potassium channels of the mitochondrial heart. Профилактическая медицина и здоровье, 4(6), 212-218.
46. Кодиров, Д., & Ахмедов, А. К. (2024). ЁШЛАРДА СУРУНКАЛИ НОСПЕЦИФИК УПКА КАСАЛЛИКЛАРИ ТАР^ АЛИШИ КЛИНИК ВА. *ОБРАЗОВАНИЕ НАУКА И ИННОВАЦИОННЫЕ ИДЕИ В МИРЕ*, *37*(5), 53-56.
47. Oltinboeva, Z. A. (2025, May 16). Ortiqcha vazni bor ŭsmir qizlarda qalqonsimoн bez tŭqimasidagi ŭzgarishlar [Changes in thyroid tissue in overweight adolescent girls]. In *International Conference on Educational Discoveries and Humanities* (p. 147). E Conf Series. https://econfseries.com
48. Oltinboyeva, Z. A., & Muxammadsodiqov, M. M. (2025). Study of thyroid functional state in overweight adolescent girls living in iodine-deficient areas. *Tibbiyot Akademiyasi Ilmiy-Uslubiy Jurnali*, 4(1), 28–32.
49. Oltinboyeva, Z. A. (2026, January). Thyroid disease prevalence in overweight adolescent girls living in iodine-deficient regions. *Global Trends in Science and Innovation*, 1(1), 308–309. Retrieved from https://imrconf.com
50. Axmedov, A. Q., & Nimatov, O. S. (2024, December). Nafas olish sistemasi kasaliklarini davolashda bakteriofag roli [The role of bacteriophages in treating respiratory system diseases]. *PEDAGOGS International Research Journal*, 72(1), 95–100. Retrieved from https://scientific-jl.org/index.php/ped/