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ЕЖЕМЕСЯЧНЫЙ НАУЧНЫЙ ЖУРНАЛ

Медицинские новости Грузии
საქართველოს სამედიცინო სიახლეები

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.

Kazantsev A.D, Lipatov K.V, Deushev A.D, Kovtun A.V, Harina A.S, Sahnó D.A, Kapustina D.S, Davydov P.K, Frolova M.O, Vajntrub G.V, Silaeva A.S, Kirsanova A.A, YUgrina D.V, Haimov S.A, Tembotova L.A, Tret'yakova D.A, Matveeva V.V, Kozak A.S, Israfilova A.F, Efimenko V.V. ELECTRONIC TRAINING PROGRAM «DRAINAGE IN MINE-BLAST INJURIES» FOR STUDYING THE MODULES OF GENERAL SURGERY.....	6-12
S. Lutvinov, O. Malinina, O. Taran, I. Sorokoumova, A. Vozniuk, M. Jaruchowska. RARE CLINICAL CASE OF CHORIOCARCINOMA WITH MULTIPLE METASTASES AND A FAVORABLE OUTCOME: DIAGNOSTIC CHALLENGES.....	13-21
Yuxin Zhu, Tong Deng, Wenjie Wen, Chao Deng, Rui Li, Donglin Zhang. EXPLORING POTENTIAL KEY GENES AND MECHANISMS OF PERIODONTITIS THROUGH INTEGRATED BIOINFORMATICS ANALYSIS.....	22-29
Davit Rekhviashvili, Giorgi Chakhunashvili, Maia Chkhaidze, Nino Abdushelishvili, Gvantsa Arveladze, Shalva Kevlishvili, Iamze Taboridze. ASSESSMENT OF THE LIPID SPECTRUM IN GEORGIAN CHILDREN WITH TYPE 1 DIABETES MELLITUS.....	30-35
Nazarova Dinara, Kemelbekov Kanatshan, Doltayeva Bibigul, Seidakhmetova Aizat, Sergazina Aigul, Khatamov Furkhat, Syzdykova Assem, Yrysbay Symbat. DYNAMICS OF THE FUNCTIONAL STATE OF THE RESPIRATORY SYSTEM IN CHILDREN DURING COMPLEX REHABILITATION.....	36-42
Ellen Safadi, Nithin Raj, Sara Musa Abdalla Elamin, Lutfullayeva Gulnoza Umrilloeyvna, Marwan Ismail. IMMEDIATE POST-ANAESTHESIA CONFUSION AND AGITATION IN ADULT SURGICAL PATIENTS: INCIDENCE AND CLINICAL CORRELATES.....	43-49
Ermira Jahja, Ardita Koçi, Irina Nakashidze. INTERLEUKIN-1 GENE POLYMORPHISMS AND SUSCEPTIBILITY TO PERIODONTITIS ACROSS ETHNICITIES AND POPULATIONS: A LITERATURE REVIEW.....	50-60
Zhanylsyn Urasheva, Alima Khamidulla, Aigul Yermagambetova, Gulnar Kabdrakhmanova, Andrej M Grjibovski. NEUTROPHIL-TO-LYMPHOCYTE RATIO AS A POTENTIAL PREDICTOR OF IN-HOSPITAL MORTALITY AMONG ISCHEMIC STROKE PATIENTS: A PROSPECTIVE COHORT STUDY.....	61-66
Denys Oklei, Serhii Nemenko. APPLICATION OF LOCAL HEMOSTATIC AGENTS FOR STRENGTHENING THE SEAMS OF COLONIC ANASTOMOSES.....	67-73
Tetiana Salií, Liliia Salií. DEEP SELF-REGULATION METHOD: A HYPNOTHERAPEUTICAL AND COACHING APPROACH TO STRESS AND BURNOUT.....	74-82
Varduhi Papoyan, Anna Nadoyan, Vahan Manukyan. PSYCHOPHYSIOLOGICAL RELATIONSHIPS BETWEEN EMOTIONAL STATES AND RESPIRATORY DYNAMICS IN DRIVERS UNDER COGNITIVE LOAD.....	83-92
Wafa H Mohamed Ahmed, Ayman Abdelaziz Idres Elfaki, Azza O Alawad. ASSESSMENT OF CARDIOVASCULAR DISEASE RISK USING ANKLE-BRACHIAL INDEX IN EMERGENCY PHYSICIANS WORKING 24-HOUR DUTIES: A CROSS-SECTIONAL STUDY.....	93-97
Madina Rashova, Aliya Kabduova, Zhanbolat Sailau, Gulzhan Serikberli, Karilkhan Nurmukhamed, Assem Munaidarova. COMPREHENSIVE ASSESSMENT OF BIOFILM FORMATION AND ANTIMICROBIAL RESISTANCE OF <i>STAPHYLOCOCCUS</i> IN PURULENT-INFLAMMATORY DISEASES.....	98-108
Aryam Ayad Al-Rashidi, Anas Ali Alhur, Aryam Faleh Al-Anazi, Yara Awad Al-Anazi, Aryam Aziz Al-Rashidi, Atha Ayad Alshammari, Bayan Nasser Alshammari, Fatima Saud Alsaeed, Karima Hamad Alazmi, Shahad Ghazi Alshammari. THE ROLE OF MEDICAL SECRETARIES IN HOSPITAL WORKFLOW, COMMUNICATION, AND HEALTH INFORMATION MANAGEMENT: A QUALITATIVE STUDY AT AL-HAIT GENERAL HOSPITAL, SAUDI ARABIA.....	109-118
Ioannis Galitsianos, Nikolaos Geropoulos, Ioannis Alexiou, Antonios Ziakas, Charalampos Karvounis. FROM COST CONTAINMENT TO VALUE CREATION: INTEGRATING PATIENT-REPORTED OUTCOMES IN CARDIOLOGY REIMBURSEMENT FRAMEWORKS-THE PARADIGM OF SELECTED EUROPEAN COUNTRIES.....	119-127
Wasan Raheem Mubark Al khafaji, Marwa Habeeb Nazzal Eswad, Aseel Mosa Jabber. ORAL N-ACETYLCYSTEINE FOR MENSTRUAL PAIN IN ADOLESCENTS: A RANDOMIZED CONTROLLED STUDY OF OXIDATIVE STRESS REDUCTION WITHOUT HORMONAL MODULATION.....	128-135
Alexandre Pateishvili, Tamar Lomidze, Manana Kalandadze, Vladimer Margvelashvili, Ann Margvelashvili. ORAL HEALTH STATUS AND ASSOCIATED RISK FACTORS AMONG PROFESSIONAL ATHLETES IN GEORGIA.....	136-143
Abdulrahman S. Alsaqabi, Ebtehal Almogbel, Faisal A. Al-Harbi, Sultan S. Al-Ruqaie, Ayoub S. Alharbi, Eyad A. Alkharraz, Abdulaziz T. Alturki, Reema K. Al-mutairi, Abdulhakim A. Al-Kharraz, Asim Ibrahim Alghelfes. ANALYSIS OF THE TYPES AND PATTERNS OF LIMB AMPUTATIONS RELATED TO DIABETIC FOOT CONDITIONS IN THE	

QASSIM REGION: A RETROSPECTIVE STUDY.....	144-152
Abrar Ghalib, Alaa Mohammed Mahmoud Qasem, Abdelgadir Elamin, Ahmed L. Osman, Mutaz Ibrahim Hassan, Ellen Safadi, Gulandom Shodikulova, Ikromi Turakhon Sharbat, Bobokalonzoda Jamoliddin Murodali, Namoz Mavlonov Xalimovich, Maxmudjon Butaboyev, Marwan Ismail.	
AEROBIC AND RESISTANCE TRAINING SHOW DIVERGENT ASSOCIATIONS WITH INSULIN SENSITIVITY AND SHORT-TERM GLYCEMIC EXPOSURE IN PREDIABETES: A CROSS-SECTIONAL STUDY.....	153-164
F.T. Khalilova, A.A. Kerimov, G.R. Kerimova.	
CLINICAL AND MOLECULAR GENETIC CHARACTERISTICS OF POLYCYTHEMIA VERA AND CURRENT TREATMENT APPROACHES.....	165-173
Malika M. Meirmanova, Aizhan A. Abiltayeva, Yoshihiro Noso, Askar M. Abiltayev, Rustem S. Kazangapov, Olga S. Makhmetova.	
CLINICAL CHARACTERISTICS, IMAGING EFFICACY, AND SAFETY OF MRI-GUIDED FOCUSED ULTRASOUND ABLATION (FUS-MRI) IN THE TREATMENT OF UTERINE FIBROIDS: A SINGLE-CENTER EXPERIENCE.....	174-182
Tskaev T.A, Tkhakumashev A.R, Panov A.V, Veselova A.V, Dibirova M.D, Seryi I.F, Mosina P.A, Shvets D.D, Gekmen M.A, Khlynov D.A, Medjidov A.N.	
COMPARATIVE ANALYSIS OF ACUTE UPPER AND LOWER EXTREMITY ISCHEMIA DUE TO ARTERIAL EMBOLISM.....	183-188
Long Huang, Zijian Yao, Xin Jin, Xin Sheng, Guoping Wang, Jin Zhou.	
THE EFFECT OF TEACHER SUPPORT ON LEARNING BURNOUT: THE MEDIATING ROLE OF SCHOOL BELONGING AND ACADEMIC RESILIENCE.....	189-197
Ghukasyan N.N.	
POST-CESAREAN SCAR ENDOMETRIOSIS: LONG LATENCY, FREQUENT MISDIAGNOSIS, AND OUTCOMES OF SURGICAL EXCISION (A CASE SERIES OF 5 PATIENTS).....	198-203
Togzhan Algazina, Dinara Azanbayeva, Natalya Tsoy, Gulnaz Touir, Tatyana Kotlyarova.	
CYTOKINE – ASSOCIATED PARAMETERS OF THE IMMUNE RESPONSE IN PSORIASIS AND THEIR CORRELATIONS WITH ALPHA – AND BETA – DIVERSITY OF THE GUT MICROBIOME.....	204-210
Tchernev G, Tchernev KG Jr, Kordeva S.	
DERMATOSURGERY ROUNDS: THE DOUBLE ROTATION (YIN-YANG) FLAP AS BASIC WEAPON IN THE FIGHT AGAINST KERATINOCYTE CANCER OF THE SCALP.....	211-214
Veen Sagvan Jamil, Mohammed Rashed Nabi Aldoski, Bahar Jaafar Selivany, Doaa Waleed Jameel.	
MORPHOLOGY AND PREVALENCE OF C-SHAPED CANALS IN MANDIBULAR FIRST MOLARS OF AN IRAQI KURDISTAN REGION POPULATION: A CONE-BEAM COMPUTED TOMOGRAPHY ASSESSMENT.....	215-218
Petro Rogozhan, Olga Drobot, Olena Kostiuchenko, Viktoriia Stamat, Oleg Nazarov.	
PSYCHOLOGICAL ASPECTS OF USING SUGGESTIVE METHODS IN COGNITIVE-BEHAVIORAL THERAPY.....	219-226
Natia Jojua, Tinatin Gognadze, Tamar Zarginava, Sopia Samkharadze, Maia Tsanova.	
EVALUATION OF GEORGIAN MEDICAL DOCTORS’ RESEARCH EXPERIENCE AND PERCEPTIONS TOWARD COLLABORATIVE RESEARCH WITH UNIVERSITIES.....	227-230
Solmaz Imanova, Babek Zeynalov, Adalat Rustam, Rana Jafarova.	
CLINICAL RESULTS OF DELORME’S AND ALTEMEIER’S PROCEDURES IN RECTAL PROLAPSE.....	231-237
Faisal A. Al-Harbi, Mohanad A. Alkuwaiti, Rasil Sulaiman Alayed, Khalid A Alkhalifah, Mayadah Assaf Alawaj, Hussam J. Alshehri, Nora Mohammed Alzoum, Abdulaziz Alroshodi, Mohammed AL Mulhim.	
NON-PHARMACOLOGICAL INTERVENTIONS FOR RESTLESS LEG SYNDROME IN HEMODIALYSIS PATIENTS: A SYSTEMATIC REVIEW AND NETWORK META-ANALYSIS.....	238-253

ORAL HEALTH STATUS AND ASSOCIATED RISK FACTORS AMONG PROFESSIONAL ATHLETES IN GEORGIA

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Abstract.

The aim of this study was to evaluate the oral health status of professional athletes in Georgia and to identify associated risk factors. A cross-sectional study was conducted among 470 professional athletes representing different sports disciplines and regions of Georgia. Data were collected using a structured questionnaire and standardized clinical examination performed under appropriate lighting conditions. Oral health was assessed using internationally recognized indices, such as DMFT (Decayed, Missing and Filled Teeth Index), OHI-S (Green-Vermillion Oral Hygiene Index), PMA (Papillary-Marginal-Alveolar Index), CPI (Community Periodontal Index), BEWE (Basic Erosive Wear Examination), and TWES (Tooth Wear Evaluation System). Statistical analysis was performed using SPSS version 23.0.

Dental caries prevalence was high (85.5%), with a mean DMFT score of 3.24 ± 1.73 and a Significant Caries Index (SCI) of 4.94. A statistically significant association was observed between the frequency of sweet carbonated beverage consumption and caries intensity (Spearman $r_s = 0.33$; $p < 0.001$). The mean OHI-S score was 1.73 ± 1.29 , indicating generally fair oral hygiene, although signs of gingival inflammation were common. According to the BEWE index, 58.7% of athletes had a low risk of erosive tooth wear, while 41.3% presented moderate to very high risk. Tooth wear was detected in 42.1% of athletes and showed a strong association with bruxism ($p < 0.001$). In addition, psychological stress and dry mouth were significantly associated with higher caries intensity. The findings indicate a considerable burden of oral diseases among professional athletes in Georgia. These results highlight the need for preventive oral health programs, improved oral hygiene education, and the integration of regular dental screening into sports medicine practice. Oral health should also be considered an important component of overall athlete health and sports performance.

Key words. Oral health, athletes, dental caries, dental erosion, tooth wear, sports dentistry.

Introduction.

Athletes are often perceived as individuals with better overall health compared to the general population. However, the prevalence of oral diseases among athletes remains a significant public health concern. Comprehensive assessment of athletes' health represents a crucial focus of modern sports medicine and includes both general and oral health evaluation. Behavioral and nutritional characteristics associated with athletes' habitual

physical activity, as well as psycho-emotional stress, may act as additional risk factors for oral health. According to current epidemiological data, dental caries, periodontal diseases, non-carious dental lesions, and trauma are widespread among athletes [1,2]. According to a meta-analysis by Azeredo et al., the prevalence of dental caries among elite athletes ranges from 15% to 89% and the DMFT index is also reported to be relatively high in several studies [1]. In a study of participants in the London 2012 Olympic Games, dental caries was detected in 55% of athletes, dental erosion in 45%, and periodontal diseases in 76% [3]. Similar trends have been observed in other athlete groups, where oral health problems have been shown to negatively impact both quality of life and athletic performance [4-6]. The prevalence of oral diseases among athletes is multifactorial. One of the leading contributing factors is the peculiarities of sports nutrition, particularly the frequent consumption of carbohydrate- and low pH sports drinks, energy gels, and protein bars [2,5,7,8]. Such products reduce salivary pH, promote enamel demineralization and the activity of cariogenic microbiota [9-12]. In addition, the frequency of carbohydrate intake should also be considered, as repeated consumption increases the risk of both dental caries and dental erosion [9,13,14]. Some studies have indicated that the regular consumption of sports drinks with low pH may increase the risk of dental erosion among athletes. In addition, athletes involved in aquatic sports may be exposed to chlorinated pool water, which can further contribute to erosive tooth wear due to its potentially acidic characteristics [15,16].

Oral health may be negatively affected by dehydration, mouth breathing, reduced salivary flow, and exercise-related psycho-emotional stress that accompany regular physical activity [9,17-19]. During intense physical activity, reduced salivary flow and reduced buffering capacity of saliva create favorable conditions for dental hard tissue damage and plaque accumulation [12,13,20]. In athletes, stress-related immune and inflammatory changes have been described, which may reduce the protective functions of saliva and contribute to the progression of oral diseases [21,22]. Oral diseases in athletes should not be considered merely as isolated dental problems; rather, they are closely related to general health and are likely to affect both the training process and athletic performance. Therefore, chronic oral conditions can be regarded not only as oral health problems but also as important factors contributing to reduced sports performance [5,23]. Professional sports are associated with an increased risk of orofacial injuries [24-26].

The use of individual protective equipment, particularly sports mouthguards and helmets plays an important role in preventing these injuries [27]. However, according to various studies, the use and monitoring of these protective devices are still insufficiently implemented in sports practice [5,28]. Recent evidence suggests that custom-made mouthguards provide better comfort and are more effective compared to standard devices [27,29].

The aim of the present study was to assess the oral health status of professional athletes in Georgia and to identify associated risk factors in this population. This study represents the first epidemiological assessment of oral health among professional athletes in Georgia.

Materials and Methods.

The study was conducted using a cross-sectional design and included professional athletes who were recruited on a voluntary basis from various sports clubs and training centers across Georgia, which ensured the diversity of the study population and increased the representativeness of the sample. A total of 470 athletes from different cities of Georgia (Tbilisi, Batumi, Kutaisi, Gori, Khashuri, Telavi, and Gurjaani) participated in the study (see Tables 1 and 2). Among the participants, 400 (85.1%) were male and 70 (14.9%) were female. The athletes represented different disciplines of sports, including contact, strength, and aquatic sports (rugby, wrestling, boxing/kickboxing, football, basketball, swimming/water polo, and dance sport). Participants were divided into three age groups: 15–20 years, 21–25 years, and ≥ 26 years. A special questionnaire was developed for the study, which was based on a review of modern scientific literature and international studies. The questionnaire was pilot-tested in a separate group of athletes ($n = 40$ rugby players) to assess clarity and comprehensibility of the items. The questionnaire included 61 items: 32 questions were completed by the athletes themselves, while the remaining data were obtained through clinical examination conducted by the dentist and the dental assistant.

Clinical examinations were performed by two dentists with the assistance of two dental assistants using standardized diagnostic criteria. Examiners were trained and calibrated prior to data collection. The examination was conducted under standard conditions and relevant lighting. Clinical assessment was performed according to standardized methodology and was based on international epidemiological indices. Data were collected on demographic characteristics, sports activity, oral hygiene habits, frequency of dental visits, consumption of sports drinks and nutritional supplements, as well as subjectively perceived stress and oral dryness (dry mouth). The level of stress was assessed using a 10-point scale, while the intensity of dry mouth was assessed on a four-point ordinal scale. Bruxism was assessed using a self-reported questionnaire on teeth grinding or clenching habits.

During the clinical examination, oral hygiene status and major dental diseases were assessed using standardized indices, including OHI-S (Green–Vermillion Oral Hygiene Index), PMA (Papillary–Marginal–Alveolar Index), CPI (Community Periodontal Index). To differentiate erosive tooth wear from mechanical tooth wear, two separate indices were used. Dental erosion was assessed using the Basic Erosive Wear Examination

(BEWE) index, reflecting chemically induced loss of dental hard tissues associated with acidic exposure. Mechanical tooth wear was evaluated using the Tooth Wear Evaluation System (TWES), focusing on occlusal and incisal surfaces and reflecting wear associated with functional or parafunctional occlusal loading. The prevalence and intensity of dental caries were assessed using the DMFT index (Decayed, Missing and Filled Teeth). The SCI (Significant Caries Index) was used to identify the group at high risk of caries. For the purpose of statistical analysis of the data, the DMFT index values were categorized into two groups: $DMFT < 4$ and $DMFT \geq 4$.

Statistical analysis was performed using the SPSS (Statistical Package for the Social Sciences), version 23. Descriptive statistics were applied, the χ^2 test was used to determine associations between categorical variables. Student's t-test was used to compare mean values, while Fisher's exact test was used in cases of small sample sizes, and Spearman's rank correlation coefficient to assess the correlation between variables. The Kruskal–Wallis test was used to compare differences between groups. Logistic regression analysis was performed to assess the association between risk factors and caries experience. Odds ratios (ORs) with 95% confidence intervals (CIs) were calculated. The level of statistical significance was set at $p < 0.05$.

The study was approved by the Medical Ethics Committee of the National Center for Disease Control and Public Health named after L. Sakvarelidze (IRB0000215). The study was conducted from April 11, 2022 to April 11, 2023. All participants signed informed consent prior to the start of the study.

Results.

Age characteristics of the study population:

The study included 470 professional athletes from Georgia, representing various disciplines of sports (see Table 1 and 2).

Prevalence of dental caries:

The overall prevalence of dental caries among the athletes participating in the study was 85.5%. The mean DMFT index was 3.24 ± 1.73 , while the Significant Caries Index (SCI) was 4.94. According to the categorization of the DMFT index, 53.6% of participants had $DMFT < 4$, whereas 46.4% had $DMFT \geq 4$.

Analysis by age groups revealed that the prevalence of dental caries was 87.5% in the 15–20 age group, 82.2% in the 21–25 age group, and 87.5% in the ≥ 26 age group. The mean DMFT values were similar across all age groups and remained within the range of moderate intensity. The highest value of the Significant Caries Index (SCI) was observed in the 15–20 age group ($SCI = 5.03$), while the SCI values in the 21–25 and ≥ 26 age groups were 4.88 and 4.84, respectively.

The prevalence of dental caries was high across all sport disciplines. The prevalence of dental caries did not differ significantly across sport disciplines (χ^2 test, $p = 0.21$). The mean DMFT values were similar among different sport groups. The highest prevalence was observed among football players (89.3%), while the lowest was recorded in sports dance (74.4%). The mean DMFT values were similar across different sports and ranged from 3.00 ± 2.00 to 3.40 ± 1.67 , indicating a moderate level of caries experience among athletes. The Significant

Table 1. Age distribution of athletes (n = 470).

Age group (years)	Number (n)	Percentage (%)
15–20	184	39.1
21–25	174	37.0
≥26	112	23.8
Total:	470	100.0

Table 2. Distribution of athletes according to sport discipline (n = 470).

Discipline of sport	Number (n)	Percentage (%)
Sports Dance	43	9.1
Rugby	76	16.2
Wrestling	65	13.8
Boxing / Kickboxing	35	7.4
Swimming / Water Polo	93	19.8
Basketball	74	15.7
Football	84	17.9
Total:	470	100.0

Table 3. DMFT index and Significant Caries Index (SCI) values according to sport discipline.

Discipline of sport	n	Prevalence of dental caries (%)	DMFT (mean ± SD)	SCI	p-value*
Sports Dance	43	74.4	3.26 ± 2.18	5.40	
Rugby	76	84.2	3.37 ± 1.76	4.92	
Wrestling	65	87.7	3.40 ± 1.67	5.05	
Boxing/Kickboxing	35	77.1	3.00 ± 2.00	5.08	
Swimming / Water Polo	93	88.2	3.20 ± 1.68	4.87	
Basketball	74	87.8	3.28 ± 1.64	4.84	
Football	84	89.3	3.07 ± 1.52	4.64	
Total	-	-	-	-	0.21

* p-value refers to comparison of caries prevalence between sport disciplines (χ^2 test).

Table 4. Oral hygiene status of athletes according to the OHI-S index.

OHI-S	n	%
Good (0–1.2)	172	36.6
Fair (1.3–3.0)	231	49.1
Poor (>3.0)	67	14.3
Total:	470	100

Table 5. Mean BEWE scores by sport discipline.

Discipline of sport	n	BEWE Mean ± SD	p-value
Sports Dance	43	1.60 ± 0.98	
Rugby	76	1.39 ± 0.69	
Wrestling	65	1.72 ± 0.91	
Boxing / Kickboxing	35	1.43 ± 0.70	
Swimming / Water Polo	93	2.22 ± 0.98	
Basketball	74	1.36 ± 0.71	
Football	84	1.80 ± 1.03	
Total			<0.001*

*Kruskal–Wallis test.

Table 6. Factors Associated with Dental Caries: Multivariate Logistic Regression Analysis.

Variable	Category	Adjusted OR	95% CI	p-value
Sugary drinks (Q16)	High vs Low	8.80	5.50–14.11	<0.001
Stress (Q25)	High vs Low/Mod	3.86	2.14–6.97	<0.001
Dry mouth (Q51)	Moderate/Severe vs Low	3.05	1.24–7.50	0.015
Oral hygiene (Q37)	Poor vs Good/Satisfactory	2.15	1.14–4.08	0.019
Sex	Male vs Female	0.71	0.39–1.30	0.27
Age	Per 1 year increase	0.99	0.93–1.05	0.67

Table 7. Distribution of tooth wear by sport discipline (TWES).

Discipline of sport	No wear n (%)	Wear limited to enamel n (%)	Dentin involvement <50% n (%)	Dentin involvement >50% n (%)	p-value*
Sports Dance	35 (81.4)	7 (16.3)	1 (2.3)	0 (0.0)	
Rugby	39 (51.3)	24 (31.6)	13 (17.1)	0 (0.0)	
Wrestling	23 (35.4)	29 (44.6)	12 (18.5)	1 (1.5)	
Boxing / Kickboxing	16 (45.7)	12 (34.3)	6 (17.1)	1 (2.9)	
Swimming / Water Polo	54 (58.1)	24 (25.8)	11 (11.8)	4 (4.3)	
Basketball	40 (54.1)	18 (24.3)	14 (18.9)	2 (2.7)	
Football	50 (59.5)	17 (20.2)	15 (17.9)	2 (2.4)	
Total	-	-	-	-	0.009

*p-value obtained using the chi-square (χ^2) test.

Caries Index (SCI) ranged from 4.64 to 5.40, with the highest value observed among sports dance athletes (see Table 3).

Sugary carbonated beverages and dental caries:

A statistically significant positive correlation was found between the frequency of consumption of sugary carbonated beverages and the DMFT index (Spearman's $r_s = 0.33$; $p < 0.001$), indicating that increased consumption of carbonated beverages is associated with higher caries intensity. When the DMFT index was categorized into two groups (<4 and ≥ 4), a statistically significant association was also observed between the frequency of sugary carbonated beverage consumption and the DMFT categories ($\chi^2 = 161.25$; $df = 3$; $p < 0.001$).

Oral hygiene status:

The oral hygiene status of the athletes was assessed using the Green-Vermillion simplified Oral Hygiene Index (OHI-S) developed by Green and Vermillion. The mean OHI-S score in the study population was 1.73 ± 1.29 . Based on the analysis of OHI-S values, good oral hygiene was observed in 36.6% of athletes ($n = 172$), fair oral hygiene in 49.1% ($n = 231$), and poor oral hygiene in 14.3% ($n = 67$) (see Table 4).

According to sport discipline, the mean OHI-S score ranged from 1.35 to 2.13. Relatively higher values were observed in the sport dancing and wrestling groups, whereas lower values were recorded in the boxing/kickboxing, football, and basketball groups.

Periodontal status:

Periodontal status was assessed using the PMA index and the Community Periodontal Index (CPI).

The mean PMA index in the study population was $13.1\% \pm 13.1\%$. Mild gingivitis was detected in 47.0% of athletes, moderate inflammation in 17.7%, while severe inflammatory changes were relatively rare (1.5%). Indicators that were within the normal range were observed in 33.8% of participants.

According to sport discipline, the mean PMA index ranged from 8.40 to 19.30. Relatively high values were observed in the wrestling and rugby groups, whereas lower values were recorded among football and basketball players.

Periodontal status was also assessed using the Community Periodontal Index (CPI). According to the obtained data, 47.0% of athletes had healthy periodontal tissues, 36.2% exhibited bleeding on probing, and 13.8% had dental calculus. Periodontal pockets were observed less frequently: pockets 4–5 mm in depth were detected in 2.3%, while pockets ≥ 6 mm were detected in 0.6% of the participants.

Sports nutrition and periodontal Health:

A statistically significant association was found between adherence to a balanced sports nutrition and the PMA index (χ^2 test, $p = 0.013$). The prevalence of moderate and severe gingivitis was higher among athletes who did not follow a balanced sports diet (23.8% and 3.0%, respectively) compared with those who followed to such dietary recommendations (14.2% and 0.7%, respectively).

Dental erosion:

Erosive tooth wear was assessed using the Basic Erosive Wear Examination (BEWE) index. In the study population, the mean BEWE score was 3.43 ± 4.34 .

Low erosion risk (BEWE 0–2) was observed in 58.7% of athletes, moderate risk (BEWE 3–8) in 18.3%, while high (9–13) and very high (≥ 14) erosion risk were recorded in 18.5% and 4.5% of participants, respectively (see Table 5). A statistically significant difference in BEWE scores was observed across sport disciplines (Kruskal–Wallis test, $p < 0.001$).

According to sport discipline, the mean BEWE score ranged from 1.36 to 2.22. Relatively higher values were observed in water sports groups, whereas lower values were recorded among basketball players and rugby athletes.

Tooth wear:

According to sport discipline, severe tooth wear was more frequently observed in contact sports, whereas in sport dancing tooth wear was absent in most cases.

A statistically significant association was found between sport discipline and the prevalence of tooth wear ($\chi^2 = 35.05$; $p = 0.009$). A significant association was also identified between the presence of bruxism and the prevalence of tooth wear ($\chi^2 = 235.87$; $p < 0.001$). Among athletes with bruxism, localized wear was observed in 55.1%, while generalized wear occurred in 33.1%. In athletes without bruxism, tooth wear was absent in the majority of cases (81.2%). (see Table 7).

Stress, dry mouth, and dental caries:

A positive correlation was observed between self-reported psychoemotional stress and caries intensity among athletes. The mean DMFT index was 2.10 ± 1.76 in athletes with low stress, 3.57 ± 1.38 in those with moderate stress, and 4.40 ± 1.32 in the high-stress group.

A statistically significant association was found between stress level and dry mouth ($\chi^2 = 21.91$; $df = 6$; $p = 0.001$). Spearman's rank correlation analysis revealed a weak positive association ($\rho = 0.15$; $p < 0.001$).

A statistically significant association was also observed between dry mouth and caries intensity ($\chi^2 = 52.11$; $df = 3$; $p < 0.001$). As the severity of dry mouth increased, the frequency of DMFT ≥ 4 also increased. Spearman's analysis showed a moderate positive correlation between the severity of dry mouth and DMFT values ($r_s = 0.38$; $p < 0.001$).

Multivariate logistic regression showed that high sugary drink consumption, psychological stress, dry mouth, and poor oral hygiene were independently associated with higher caries experience (DMFT ≥ 4). Sugary drinks had the strongest association (OR = 8.80, $p < 0.001$), followed by stress (OR = 3.86, $p < 0.001$), dry mouth (OR = 3.05, $p = 0.015$), and poor oral hygiene (OR = 2.15, $p = 0.019$). Age and sex were not significant (see Table 6).

Discussion.

Demographic and sports characteristics:

The mean age of the athletes participating in the study was 22.4 ± 4.3 years, indicating that the study population mainly included individuals in the active sports age. A similar age distribution has been reported in epidemiological studies of professional athletes [3,30], where the majority of participants belonged to the age group of 20–25 years. In the present study, athletes aged 15–25 years constituted 76.1% of the total population, which corresponds to the peak period of athletic performance. A comparable age structure has also been described in studies assessing the oral health of participants in international sport events [3,6]. The proportion of athletes aged ≥ 26 years was relatively lower, which may be explained by the gradual decrease in active participation in professional sports with increasing age [31]. Athletes participating in the study represented various sport disciplines, which ensured the heterogeneity of the study population and provided an opportunity to assess the potential impact of different types of sports activity on oral health. A similarly diverse structure of study populations has also been described in international studies of athletes [3].

Dental caries:

According to the results of our study, a moderate level of caries intensity was observed (see Table 3). The Significant Caries Index (SCI = 4.94) reflects a greater burden of caries in the high-risk subgroup of athletes. A similar trend has been reported in international studies [3,31], where elevated SCI values have been associated with athletes' dietary habits, particularly the frequent consumption of energy drinks and carbohydrate-rich beverages, as well as reduced salivary flow during intense physical activity. These circumstances are likely to lead to a decrease in oral pH, which contributes to the development of the carious process [9,10,14].

In our study, caries intensity did not differ substantially across sport disciplines, which is consistent with the results of other studies [6,30], where the prevalence of dental caries was more strongly associated with behavioral factors than with specific types of sport.

In addition, a moderate positive correlation was identified between the frequency of sugary carbonated beverage consumption and DMFT values ($r_s = 0.33$; $p < 0.001$), indicating that increased intake of such beverages was associated

with higher caries intensity. Similar associations have been described in other international studies [3,10], where the regular consumption of acidic and carbohydrate-rich drinks among athletes was linked to a significant prevalence of dental caries.

Oral hygiene and periodontal status:

The oral hygiene status observed in the studied population appears consistent with patterns reported in previous research. Similar findings have been reported in international studies on athletes' oral health, where the oral hygiene status of sports populations is often described as predominantly fair or poor [4,33]. These results may be related to athletes' dietary habits, dehydration associated with intense physical activity, and insufficient control of oral hygiene care.

To some extent, the mean OHI-S values differed across sport disciplines, similarly to the tendency described in other studies, where oral hygiene status has been associated with the specific characteristics of physical activity and athletes' lifestyle [2,4].

When assessing periodontal status, the mean PMA index was $13.1\% \pm 13.1\%$, and various degrees of gingivitis were observed in a considerable proportion of athletes. Mild gingivitis was detected in 47.0%, moderate inflammation in 17.7%, whereas severe inflammatory changes were relatively rare (1.5%). According to the Community Periodontal Index (CPI), 47.0% of athletes presented with healthy periodontal tissues, while 36.2% exhibited bleeding on probing, indicating the presence of gingival inflammation. Periodontal pockets were relatively rare, being detected in 2.3% and 0.6% of participants. Similar findings have been reported in international studies, where gingivitis and bleeding on probing are frequently observed among professional athletes, whereas severe periodontal lesions are comparatively uncommon [4,33].

It should also be noted that a significant proportion of participants in our study belonged to younger age groups, which may partly influence the prevalence of gingivitis. During puberty, gingival inflammatory changes are often associated with hormonal alterations and increased tissue reactivity to dental plaque [34]. However, given the relatively small proportion of juvenile athletes in our study, this factor was unlikely to have a substantial influence on the overall results. According to international literature, the relatively low prevalence of severe periodontal disease may also be explained by the young age of the study population and the possibility that regular physical activity is associated with a lower prevalence of periodontal disease [35,36].

Dental erosion and tooth wear:

Erosive lesions of dental hard tissues in athletic populations are associated with the consumption of sports drinks and functional changes in saliva during intense physical activity. In our study, the prevalence of dental erosion was assessed using the Basic Erosive Wear Examination (BEWE) index. The mean BEWE score was 3.43 ± 4.34 . A low risk of erosion was identified in 58.7% of athletes, whereas notable erosive lesions (BEWE ≥ 3) were detected in 41.3% of participants, indicating the presence of dental erosion in a considerable proportion of the studied athletic population.

When analyzing erosion according to sport discipline, the highest mean BEWE value was observed in the swimming/

water polo group (2.22 ± 0.98). This finding may be associated with prolonged exposure of tooth enamel to chlorinated pool water. Favero R et al. reported that erosive enamel lesions occur more frequently in regular swimmers compared to the general population [37,38].

According to the results of our study, relatively higher BEWE values were also observed among football players and wrestlers. However, overall, the prevalence of dental erosion in our study corresponds to the findings reported in international studies, where the prevalence of dental erosion among athletes ranges from approximately 6% to 60% [16,39]. These findings suggest that athletes may represent a risk group for the development of erosive dental lesions.

In addition to the assessment of erosion, mechanical tooth wear of dental hard tissues was evaluated using the Tooth Wear Evaluation System (TWES). According to our data, different degrees of tooth wear were identified in 42.1% of athletes. Wear limited to enamel was observed in 28.5%, while dentin involvement was detected in 8.3% and 5.3% of participants, respectively. According to the literature, tooth wear in athletes is often associated with occlusal parafunctions, including bruxism and strong tooth contact, which may be related to increased muscular activity during intense physical exertion [13]. It has also been reported that prolonged physical activity may affect salivary properties and the resistance of dental hard tissues, thereby contributing to the development of both erosive and mechanical tooth wear [9,20].

A statistically significant association was identified between sport discipline and the prevalence of tooth wear ($\chi^2 = 35.05$; $p = 0.009$). Tooth wear was relatively uncommon among sport dancing athletes, whereas in contact sports—particularly wrestling, boxing/kickboxing, and rugby—wear lesions involving enamel and dentin were observed more frequently.

Among athletes with bruxism, tooth wear occurred more frequently and was most often presented in a localized form, whereas in athletes without bruxism the prevalence of tooth wear was considerably lower. These findings are consistent with data reported in the literature, where bruxism is considered one of the main etiological factors of mechanical tooth wear [13].

Stress, dry mouth and dental caries:

International studies are increasingly focusing on the impact of psycho-emotional factors, including stress, on athletes' health. Stress associated with intensive sports activity may affect the immune system and various physiological processes, which may subsequently influence both general and oral health in athletes [12,17]. In Georgia, such an integrated approach remains relatively underrepresented in local studies assessing athletes' health. The results of our study suggest a possible influence of stress on athletes' oral health. Specifically, as the level of stress increased, the intensity of dental caries among athletes also increased. These findings are consistent with data reported in the literature, where professional sports activity and psycho-emotional factors are considered to have a potential negative impact on health, including oral status [12,17].

A noteworthy finding of our study is the association between psycho-emotional stress and self-reported oral dryness. Intense physical activity and psycho-emotional factors may reduce

salivary secretion and alter its buffering capacity [9,20]. These changes may create favorable conditions for the development of dental caries. According to our data analysis, oral dryness was associated with a higher prevalence of caries among athletes. This finding is consistent with international studies in which changes in salivary secretion and dietary habits are considered important risk factors for the development of dental caries [2,10,14].

The findings suggest that behavioral and oral factors, particularly sugary drink consumption, stress, dry mouth, and poor oral hygiene, play a key role in caries development, while demographic factors showed no significant influence.

The relatively high prevalence of oral diseases observed among athletes may also be partially associated with general health education. In Georgia, the school system does not routinely incorporate preventive dental visits or structured oral health education programs, which could promote early awareness and prevention among children and adolescents. As a result, opportunities to develop proper oral hygiene habits and an understanding of the relationship between oral and general health may be limited. Therefore, strengthening oral health education and preventive dental programs, particularly within sports institutions and youth training environments, may represent an important step toward improving both oral and general health. This is especially relevant considering that many professional athletes dedicate a substantial amount of time to training and competitions from an early age.

Limitations.

This study has several limitations. First, its cross-sectional design does not allow for the establishment of causal relationships, and some variables were assessed using self-reported measures, which may introduce bias. In addition, the predominance of male participants may limit the generalizability of the findings and restrict the analysis of gender-related differences. Although the questionnaire was pilot-tested prior to the main survey, formal validation and reliability analyses were not conducted.

Conclusion.

The results of the study demonstrated a high prevalence of oral diseases among professional athletes. The prevalence of dental caries was 85.5%, while the mean DMFT index was 3.24, indicating a moderate level of caries intensity in the studied athletic population. In addition, a statistically significant association was observed between the consumption of carbonated beverages and caries intensity, highlighting the important role of dietary behavior in oral health. Caries experience in athletes is primarily associated with modifiable behavioral and oral health factors rather than age or sex.

The oral hygiene status among athletes was generally fair (OHI-S=1.73); however, mild inflammatory periodontal changes were frequently observed, while severe periodontal lesions were rare. Non-carious lesions of hard dental tissues, including erosion, were also prevalent among athletes. Mechanical tooth wear, on the other hand, was often associated with the presence of bruxism. The oral diseases among athletes may be partly associated with limited health education and the absence of school-based preventive dental programs, highlighting the

importance for improved oral health education and preventive dental measures. Therefore, the systematic integration of preventive dental care and regular oral health monitoring into sports medicine practice is essential for maintaining oral health and supporting the overall well-being of athletes.

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Резюме.

Целью настоящего исследования было оценить состояние здоровья полости рта у профессиональных спортсменов в Грузии и выявить связанные с ним факторы риска. Проведено поперечное (cross-sectional) исследование, в котором приняли участие 470 профессиональных спортсменов, представляющих различные спортивные дисциплины и регионы Грузии. Сбор данных осуществлялся с использованием структурированного опросника и стандартизированного клинического обследования, проведенного при соответствующих условиях освещения. Состояние полости рта оценивалось с использованием международно признанных эпидемиологических индексов, включая DMFT (Decayed, Missing and Filled Teeth Index), OHI-S (Green-Vermillion Oral Hygiene Index), PMA (Papillary-Marginal-Alveolar Index), CPI (Community Periodontal Index), BEWE (Basic Erosive Wear Examination) и TWES (Tooth Wear Evaluation System). Статистический анализ проводился с использованием программного пакета SPSS версии 23.0. Распространенность кариеса среди спортсменов была высокой (85,5%), при среднем значении индекса DMFT $3,24 \pm 1,73$. Значение Significant Caries Index (SCI) составило 4,94. Выявлена статистически значимая связь между частотой потребления сладких газированных напитков и интенсивностью кариеса (Spearman $r_s = 0,33$; $p < 0,001$). Среднее значение индекса OHI-S составило $1,73 \pm 1,29$, что свидетельствует преимущественно об удовлетворительном уровне гигиены полости рта, хотя признаки воспаления десен встречались достаточно часто. Согласно индексу BEWE, у 58,7% спортсменов выявлен низкий риск эрозии зубов, тогда как у 41,3% отмечался умеренный и высокий риск. Износ твердых тканей зубов выявлен у 42,1% спортсменов и был статистически значимо ассоциирован с наличием бруксизма ($p < 0,001$). Кроме того, выявлена статистически значимая связь между психоэмоциональным стрессом, субъективно ощущаемой сухостью полости рта и более высокой интенсивностью кариеса. Полученные результаты свидетельствуют о значительной распространенности заболеваний полости рта среди профессиональных спортсменов в Грузии. Полученные данные подчеркивают необходимость внедрения профилактических стоматологических

программ, улучшения гигиенического образования и интеграции регулярного стоматологического мониторинга в практику спортивной медицины. Состояние полости рта также следует рассматривать как важный компонент общего здоровья спортсменов и их спортивной результативности.

რეზიუმე

კვლევის მიზანს წარმოადგენდა საქართველოში პროფესიონალ სპორტსმენებში პირის ღრუს ჯანმრთელობის მდგომარეობის შეფასება და მასთან დაკავშირებული სხვადასხვა ტიპის რისკ-ფაქტორების იდენტიფიცირება. განხორციელდა ჯვარედინი (cross-sectional) კვლევა, რომელშიც მონაწილეობდა საქართველოს სხვადასხვა რეგიონიდან შერჩეული 470 პროფესიონალი სპორტსმენი. მონაცემები შეგროვდა სტრუქტურირებული კითხვარისა და სტანდარტული კლინიკური გამოკვლევის საფუძველზე. პირის ღრუს სტატუსი შეფასდა საერთაშორისო ეპიდემიოლოგიური ინდექსების გამოყენებით, მათ შორის DMFT (Decayed, Missing and Filled Teeth Index), OHI-S (Green-Vermillion Oral Hygiene Index), PMA (Papillary-Marginal-Alveolar Index), CPI (Community Periodontal Index), BEWE (Basic Erosive Wear Examination) და TWES (Tooth Wear Evaluation System). სტატისტიკური ანალიზი განხორციელდა პროგრამული პაკეტის SPSS-ის (ვერსია 23) გამოყენებით. კვლევის შედეგების მიხედვით, სპორტსმენებში კარიესის გავრცელება მაღალი იყო (85.5%), ხოლო კბა (DMFT) ინდექსის საშუალო მაჩვენებელი შეადგენდა 3.24 ± 1.73 -ს. მნიშვნელოვანი კარიესის ინდექსი (SCI) იყო 4.94. გამოვლინდა სტატისტიკურად მნიშვნელოვანი კავშირი ტკბილი გაზიანი სასმელების მიღების სიხშირესა და კარიესის ინტენსივობას შორის (Spearman $r_s = 0.33$; $p < 0.001$). OHI-S ინდექსის საშუალო მაჩვენებელი შეადგენდა 1.73 ± 1.29 -ს, რაც ასახავს სპორტსმენთა უმრავლესობაში პირის ღრუს ჰიგიენის ძირითადად დამაკმაყოფილებელ მდგომარეობას. სპორტსმენთა მნიშვნელოვან ნაწილში აღინიშნებოდა ღრძილების მსუბუქი ანთებითი ცვლილებები. BEWE ინდექსის მიხედვით, სპორტსმენთა 58.7%-ში გამოვლინდა ეროზიის დაბალი რისკი, ხოლო 41.3%-ში — ზომიერი და მაღალი რისკი. კბილის ცვეთა ძირითადად ლოკალიზებული ფორმით იყო წარმოდგენილი სპორტსმენთა 42.1%-ში და სტატისტიკურად სარწმუნოდ იყო ასოცირებული ბრუსისიზმის არსებობასთან ($p < 0.001$). ასევე დადგინდა თვითშეფასებული ფსიქოემოციური სტრესისა და პირის ღრუს სიმშრალის სტატისტიკურად მნიშვნელოვანი კავშირი კარიესის ინტენსივობასთან. კვლევის შედეგები მიუთითებს საქართველოში პროფესიონალ სპორტსმენებში პირის ღრუს დაავადებების მნიშვნელოვან გავრცელებაზე. მიღებული მონაცემები ხაზს უსვამს პრევენციული სტომატოლოგიური პროგრამების დანერგვის, პირის ღრუს ჰიგიენის განათლების გაუმჯობესებისა და სპორტული მედიცინის ფარგლებში რეგულარული სტომატოლოგიური მონიტორინგის მნიშვნელობას. ასევე მნიშვნელოვანია პირის ღრუს ჯანმრთელობის განხილვა სპორტსმენთა ზოგადი ჯანმრთელობისა და სპორტული წარმადობის მნიშვნელოვან კომპონენტად.