

GEORGIAN MEDICAL NEWS

ISSN 1512-0112

NO 7-8 (376-377) Июль-Август 2026

ТБИЛИСИ - NEW YORK



ЕЖЕМЕСЯЧНЫЙ НАУЧНЫЙ ЖУРНАЛ

Медицинские новости Грузии
საქართველოს სამედიცინო სიახლენი

GEORGIAN MEDICAL NEWS

Monthly Georgia-US joint scientific journal published both in electronic and paper formats of the Agency of Medical Information of the Georgian Association of Business Press.
Published since 1994. Distributed in NIS, EU and USA.

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 ბაზებში.

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 საყურადღებო!

რედაქციაში სტატიის წარმოდგენისას საჭიროა დავიცვათ 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, შემავჯამებელი და პროცენტული მონაცემები უნდა შეესაბამებოდეს ტექსტში მოყვანილს.

6. ფოტოსურათები უნდა იყოს კონტრასტული; სურათები, ნახაზები, დიაგრამები - დასათაურებული, დანომრილი და სათანადო ადგილას ჩასმული. რენტგენოგრაფიის ფოტოსურათები წარმოადგინეთ პოზიტიური გამოსახულებით **tiff** ფორმატში. მიკროფოტოსურათების წარწერებში საჭიროა მიუთითოთ ოკულარის ან ობიექტივის საშუალებით გადიდების ხარისხი, ანათალების შედეგების 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.

Nana Shavlakadze, Irine Phkhakadze, Ana Silagadze, Dali Kobuladze, Alina Pakhuridze. CHRONIC URTICARIA AND LEAD EXPOSURE: EVALUATION OF IMMUNOLOGICAL MARKERS.....	6-16
Jangirashvili T, Kikoria G, Tevdorashvili N, Kapanadze L, Odikadze N. PSYCHOLOGICAL WELL-BEING AMONG MEDICAL STUDENTS AT FIVE UNIVERSITIES IN TBILISI, GEORGIA: A CROSS-SECTIONAL STUDY OF PERCEIVED STRESS, ANXIETY, AND SLEEP QUALITY.....	17-23
Yueyue Lu, Yigao Wu. ADVANCES IN RESEARCH OF PSYCHOTHERAPY FOR SOCIAL ANXIETY DISORDER.....	24-31
Saburov Alisher, Kemelbekov Kanatzhan, Arybzhanov Dauranbek, Abdurakhmanov Babur, Huseinov Zafar, Saburova Saidakhon, Tuktibayeva Saule, Yernazarov Adlet, Alipbekova Sandugash. ROLE OF NEOADJUVANT THERAPY FOR PATIENTS WITH GASTRIC CANCER: MULTIDISCIPLINARY HOSPITAL WITH ONCOLOGY CENTER.....	32-37
David Tchkonია, Nino Gabashvili, Teona Mskhaladze, Tamari Kevlishvili, Mikolay Chkonia. EFFICACY OF ENDOBRONCHIAL VALVE PLACEMENT IN THE MANAGEMENT OF PULMONARY HEMORRHAGE: A COMPARATIVE STUDY.....	38-42
Baglan Kemelbekov, Ainur Amanzholykyz, Samat Saparbayev, Manarbek Askarov, Edgaras Stankevicius. IMPACT OF STEM CELL THERAPY ADDED TO GUIDELINE-DIRECTED MEDICAL THERAPY ON QUALITY OF LIFE IN PATIENTS WITH ISCHEMIC CARDIOMYOPATHY.....	43-50
Abramishvili T, Papava K, Mamisashvili M, Tkeshelashvili M, Tsinamdzgvrishvili B. CARDIAC STRAIN IN WOMEN WITH A DOCUMENTED HISTORY OF OVERT OR SUBCLINICAL HYPOTHYROIDISM: AN EXPLORATORY SPECKLE-TRACKING ECHOCARDIOGRAPHY STUDY.....	51-56
TEREZA Y. AZATYAN. FORMATION AND DISTRIBUTION PATTERNS OF FUNCTIONAL INTERHEMISPHERIC BRAIN ASYMMETRY IN CHILDREN WITH INTELLECTUAL DISABILITIES.....	57-63
Fai Twrki Althoini, Ebtehal Solaiman Almogbel. CARDIOMETABOLIC RISK PROFILES IN ADULTS WITH DIABETES: ASSOCIATIONS WITH GLYCEMIC CONTROL, DIABETES TYPE, AND DEMOGRAPHIC CHARACTERISTICS.....	64-77
Datumyan G.S, Shaboyan K.R, Muradyan A.A, Shaboyan E.K, Galstyan A.S, Badalyan A, Sargsyan M.V. IMPACT OF THE COVID-19 PANDEMIC ON THE SEVERITY AND OUTCOMES OF GUNSHOT INJURIES.....	78-84
Zhanar Kozhakhmetova, Nazym Yelemessova, Syzdykova Dinara, Abdullina Sayagul, Nagima Issatayeva, Assiya Turgambayeva, Gulnara Kamalbekova, Diana Zhumagaleyeva, Akmaral Mussakhanova. CRITICAL VALUES OF HEMOSTASIS PARAMETERS IN AN ONCOLOGY CENTER: A RETROSPECTIVE REGISTRY-BASED STUDY.....	85-92
Gradil G.I, Torianyk I.I, Yurko K.V, Shiyan D.M, Merkulova N.F, Mohylenets O.I, Tkachenko V.G, Karmazina I.S, Lantukh A.P, Hryhorov Y.B, Gargin V.V. ASSOCIATION OF PULMONARY AND CUTANEOUS CHANGES IN COVID-19-RELATED CONDITIONS.....	93-98
Alaa MA. Albayaty, Alaa M. Sadiq, Ali SJ. Al Qaissi. ASSOCIATION BETWEEN INFLAMMATORY MARKERS, LIVER ENZYMES, LIPID PROFILE, AND VITAMIN D STATUS IN ADULTS WITH OBESITY: A CROSS-SECTIONAL STUDY.....	99-104
Kenzhebaeva B, Baimuratova M, Kalmakhanov S, Budakoğlu I.I, Laktionova M, Abdulkalikova D. IMPACT OF CLINICAL, ORGANIZATIONAL, AND PSYCHOSOCIAL FACTORS ON THE QUALITY OF LIFE OF PATIENTS WITH DERMATOVENEREOLGICAL DISEASES.....	105-114
Obidov F. Kh, Shamsiev E. A, Samatov F. F, Naimov Dilshod Kayim ugli, Khalimova F. T, Marwan Ismail. BIOMARKER-ORIENTED REHABILITATION IN CHRONIC CEREBRAL ISCHEMIA.....	115-122
Raghad Alkhalify, Lina Almutairi, Fatimah Alghofaili, Wasan Alhawaish, Thekra Alhumidi. COMPARATIVE IN-VITRO QUALITY EVALUATION OF COMMERCIALLY AVAILABLE DICLOFENAC SODIUM TABLETS.....	123-131
Ali S. Jumaah, Ali A. Younis, Shamil H. Othman. EFFECTS OF CURCUMIN ON CLINICAL OUTCOMES AND INFLAMMATORY BIOMARKERS IN KNEE OSTEOARTHRITIS: A RANDOMIZED TRIAL.....	132-138
Ashot Markosyan, Diana Alaverdieva, Mark Danghyan, Ani Mkrtchyan, Lusine Balayan, Khachik Hakobyan, Arpine Geolchanyan, Tigran Soghomonyan, Volodya Mirzoyan. SYNTHESIS AND SOME BIOLOGICAL PROPERTIES OF DERIVATIVES OF 2,3-DISUBSTITUTED 5,5-DIMETHYL-BENZO[h]QUINAZOLIN-4(1H)-ONES.....	139-143

J. Gobadze, M. Nagervadze, T. Gogitidze, N. Bejanidze, N. Zarnadze, K. Dolidze. IMPACT OF GESTATIONAL DIABETES MELLITUS ON NEONATAL BIRTH WEIGHT, LENGTH, AND GESTATIONAL AGE: A RETROSPECTIVE CASE-CONTROL STUDY	144-151
Liudmyla Bashkistrova, Iryna Romanova, Vitalii Yatsynovych, Oleksandr Zlobin, Artem Lanskoi. EVIDENCE-BASED PHARMACOTHERAPY FOR ANXIETY DISORDERS COMORBID WITH PTSD: A SYSTEMATIC REVIEW	152-163
Madina Makhmudova, Tolegen Kerimbekov, Zhaina Berikbayeva, Dinara Turebekova, Lyudmila Akhmaltdinova, Yefim Alisseiko, Olga Avdienko, Madina Rashova. IN VITRO INVESTIGATION OF THE POTENTIAL OF C60 FULLERENES AS ADJUVANTS OF NONSPECIFIC IMMUNITY	164-168
Tchernev G, Tchernev KG Jr, Kordeva S. DERMATOLOGIC SURGERY ROUNDS: THE LIMBERG FLAP AND V-TO-T CLOSURE FOR CUTANEOUS/ MUCOCUTANEOUS DEFECTS FOLLOWING SKIN CANCER EXCISION IN HIGH-RISK FACIAL REGIONS	169-174
Nino Nadiradze, Zurab Ckhaidze. SELF-RATED HEALTH IN THE POPULATION OF MEDICAL WORKERS IN GEORGIA	175-180
Argjend Shala, Nexhmedin Shala, Fisnik Jashari, Blert Jashari, Rushit Jashari. SPORADIC CREUTZFELDT-JAKOB DISEASE: CLINICAL FEATURES, DIAGNOSIS AND THERAPEUTIC HORIZONS	181-189
Omar S. Salman, Adeeb A. Al-Zubaidy. ACEBROPHYLLINE REPROGRAMS INFLAMMATORY AND REDOX SIGNALLING IN EXPERIMENTAL ULCERATIVE COLITIS: A DOSE-DEPENDENT STUDY	190-199
Eib K. Eibov, Solikhabonu Khavaskhonova, Kamshat S. Taubay, Karlygash Zh. Sadykova. CALCULATED WHOLE BLOOD VISCOSITY IS SPECIFICALLY ASSOCIATED WITH ABDOMINAL OBESITY, BUT NOT WITH OTHER COMPONENTS OF METABOLIC SYNDROME: A CROSS-SECTIONAL STUDY IN A CENTRAL ASIAN ADULT COHORT	200-208
Shqiponje Gashi, Erza Voca Mulaj, Naser Rugova, Suzana Dvojakovska, Filip Koneski. MANAGEMENT OF PERIOPERATIVE BLEEDING IN PATIENTS WITH PLATELET HYPOAGGREGABILITY DURING DENTOALVEOLAR SURGERY: CLINICAL OUTCOMES AND THERAPEUTIC APPROACHES	209-214
Alina Articulo, Rigor Rey Cuevas, Hani Al-Najjar, Rahaf Alkhuraif, Rasha Aburmeishan, Abdulaziz Almatrody. EXPLORING THE SATISFACTION OF NEWLY HIRED NURSES USING AN EVIDENCE-BASED, PERSONALIZED ONBOARDING PROGRAM: A CROSS-SECTIONAL ANALYSIS	215-222
Nagima Issatayeva, Samal Duisekova, Meruert Saberbekova, Roza Tumanova, Larisa Guruleva, Sholpan Mukanova. APPLICATION OF THE FAILURE MODE AND EFFECTS ANALYSIS METHOD IN HEALTHCARE: A CASE STUDY OF A UNIVERSITY MEDICAL CENTER IN KAZAKHSTAN	223-237
Hisham R. Ezzat, Ibrahim M. Faisal. CARDIOPROTECTIVE EFFECTS OF SILYMARIN AND VITAMIN E AGAINST DOXORUBICIN-INDUCED CARDIOTOXICITY IN RATS: EVIDENCE FROM OXIDATIVE STRESS MARKERS AND HISTOPATHOLOGICAL ANALYSIS	238-245
Shishniashvili D.S, Bedinashvili Z.J, Tsomaia K.B, Svanadze L.M, Chkhikvishvili N.M, Durglishvili G.A. FIRST-VOID URINE VERSUS URETHRAL SWAB FOR MOLECULAR DETECTION OF SEXUALLY TRANSMITTED INFECTIONS IN MEN WITH MULTIPLE SEXUAL PARTNERS	246-252
Chekhovska G.S, Pustova N.O, Syzon O.O, Chaplyk-Chyzho I.O, Dashko M.O, Vozniak I.Ya, Volbyn S.V, Ivaniushko-Nazarko N.V, Zhemela O.D, Gargin V.V. NAIL PLATE DAMAGE INDEX IN DERMATOSCOPIC EXAMINATION OF PATIENTS WITH ONYCHOMYCOSIS	253-258
Meng-Yun Zhou, Shi-qi Yu, Shao-jie Zhu, Xiang Kong, Xin-Ming Yao. A NOVEL KCNJ5 GENE MUTATION ASSOCIATED WITH FAMILIAL ALDOSTERONISM TYPE III WITHOUT HYPERTENSION	259-265
Koba Kamashidze, Tina Beruchashvili, Irina Nakashidze, Sarfraz Ahmad, Tamar Peshkova. BRIDGING THE COVERAGE-PARTICIPATION GAP: BEHAVIORAL DETERMINANTS OF CERVICAL CANCER SCREENING AMONG WOMEN IN ADJARA, GEORGIA	266-273
T.N. Kosayeva, A.T. Amiraslanov, H.K. Muradov, A.Y. Gaziyeu, B.E. Abbasov. PD-L1 EXPRESSION AND SERUM CA125: CLINICOPATHOLOGICAL CORRELATIONS IN HIGH-GRADE SEROUS OVARIAN CARCINOMA	274-280
Ruziyeva Amira Asrorovna, Khamidov Obid Abdurakhmanovich, Murodqosimov Saidolim, Doniyorov Bakhridin Baxrom ugli, Khalimova F.T, Marwan Ismail. ACE I/D AND NOS3 G894T POLYMORPHISMS AND CARDIOVASCULAR ADAPTATION PROFILES IN ADOLESCENT FOOTBALL PLAYERS	281-288

Mukhriddin Umbarov Ochilovich, Shamsutdinova Maksuda Ilyasovna, Abdullayev Ravshanbek Babajonovich, Rokhila Bakhriiddinovna Mengliyeva. ASSOCIATIONS OF CYTOKINE PROFILE AND EXOCRINE PANCREATIC FUNCTION WITH A SYMPTOM-BASED DEHYDRATION CATEGORY AND SEASON OF PRESENTATION IN CHRONIC PANCREATITIS: A RETROSPECTIVE STUDY.....	289-297
Saeed H. Hussein, Hiba M. Ahmed, Ahmed A. Ahmed. DETECTION OF HEPATITIS B AND C VIRAL INFECTION AMONG CHILDREN WITH ACUTE LEUKAEMIA.....	298-302
Davit Kobuladze, Ahishtan Febrian Nishanthan, Nino Kedelidze, Rusudan Vadatchkoria, Magda Davitashvili, Lamara Zuroshvili, Darejan Margalitashvili, Nani Gvarishvili, Nazi Turmanidze, Tamar Peshkova, Naman Chauhan, Teona Gogitidze, Nameera Parveen Shaikh, Aleena Parveen Shaikh, Abeshana Febrian Nishanthan, Irina Nakashidze. SELECTED LABORATORY PARAMETERS IN PEDIATRIC PATIENTS WITH COVID-19 STRATIFIED BY WHITE BLOOD CELL AND PLATELET PROFILES.....	303-309
Rawan Waleed, Abrar Fadlalla, Jana Abdullah, Marwan Ismail, Mohammed Ibrahim Saeed, Ahmad Luay Osman Hashim, Abdelgadir Elamin Eltom. IMPACT OF HELICOBACTER PYLORI INFECTION ON VITAMIN B12 DEFICIENCY LEVELS: A RETROSPECTIVE STUDY.....	310-315
T.A. Asgarova, K.M. Rahimli, G.A. Valiyeva, Sh.I. Hasanova, F.E. Guliyeva, Kh.R. Mammadova. SOME HEREDITARY DISEASES PREVALENT IN THE REPUBLIC OF AZERBAIJAN.....	316-319
Sahadete Shala, Ferdita Haxhiu Derguti. PSOAS MUSCLE ABSCESS FOLLOWING CESAREAN SECTION: A CASE REPORT.....	320-322
N. Kajaia, L. Gabunia, M. Mantskava, S. Kalmakhelidze, G. Ormotsadze, S. Turabelidze-Robaqidze, T. Sanikidze. PRO-INFLAMMATORY INTERLEUKINS AND OXIDATIVE IMBALANCE IN L-NAME-INDUCED HYPERTENSION: COMPARATIVE EFFECTS OF β -BLOCKERS.....	323-330
Hussein Fadhil Abdulameer, Raed Aziz Badeia. COMPARATIVE EVALUATION OF TWO HERBAL MOUTHWASHES AND CHLORHEXIDINE ON CALPROTECTIN IN GINGIVITIS PATIENTS: A DOUBLE-BLIND RANDOMIZED CONTROLLED TRIAL.....	331-340
J. Gobadze, M. Nagervadze, T. Gogitidze, N. Bejanidze, T. Koiava. SOME BIOLOGICAL CHARACTERISTICS ASSOCIATED WITH GESTATIONAL DIABETES.....	341-348
Yurevych N. O, Sazonova O. N, Kachailo I.A, Hnidyk Yu. V, Pokotylo P. B, Podolyuk M.V, Blyshak N. B, Mykhalevych M. M, Zherebkin V. V, Kosynskyi O. V, Aliksieieva V. V. THREE-DIMENSIONAL CT-BASED MORPHOMETRIC ASSESSMENT OF THE MAXILLARY SINUS.....	349-355
Simbarashe Magaisa. PERCEPTIONS AND PRACTICES OF HEALTHCARE PROVIDERS IN MATERNAL MORTALITY AND STILLBIRTH PREVENTION AND MANAGEMENT: INSIGHTS FROM LEJWELEPUTSWA DISTRICT.....	356-363
Akezhan Rustemuly Astrakhanov, Ainur Amanzholkyzy, Samat Sagatovich Saparbayev, Meirambek Sagnaevich Kurmangazin, Aigerim Iskakova, Gulzhanat Nurlanova. THE ROLE OF CELL THERAPY IN THE COMPREHENSIVE TREATMENT OF CHRONIC HEPATITIS C-RELATED LIVER CIRRHOSIS.....	364-370
Miranda Shervashidze, Khatia Dolidze, Tamar Bakhtadze, Tamar Shervashidze. PREVENTING EXERCISE-RELATED SUDDEN CARDIAC DEATH THROUGH SYSTEMATIC PREPARTICIPATION CARDIOVASCULAR SCREENING: A TWO-YEAR REGIONAL COHORT STUDY OF PEDIATRIC ATHLETES IN ADJARA, GEORGIA.....	371-380
Waseem Hashim Alkhaffaf, Muhammad A. Alkataan. COMPARATIVE EFFICACY OF 200 UNITS VERSUS 155 UNITS OF ONABOTULINUMTOXIN A FOR CHRONIC MIGRAINE.....	381-388
K. Tovar Calderón, J. Orozco Pilco, C. Calderón Cabezas, K. Caiza Cuello. ETHNIC DISPARITIES IN BIRTH WEIGHT AND PRENATAL CARE UTILIZATION IN ECUADOR, 2024.....	389-394
Gaukhar Issakova, Suriya Yessentayeva, Daniyar Amangaliyev, Askhat Bralov, Assiya M. Issayeva, Yestay Abzalbek, Marat Akhetov. INDICATIONS FOR REMOVAL OF A PORT SYSTEM IN A PATIENT WITH SUSPECTED SEPTICEMIA IN THE ABSENCE OF OTHER LOCAL SOURCES OF INFECTION.....	395-398
Mohammed A. Hayawi, Duaa M. Al-Nafoly. PREDOMINANCE OF FOLLICULAR ADENOMA AND PAPILLARY CARCINOMA IN THYROID NEOPLASMS.....	399-403
Nino Buadze, Nata Kazakhashvili. POPULATION KNOWLEDGE, RISK PERCEPTION, GOVERNANCE AND PUBLIC HEALTH DETERMINANTS OF COVID-19 IN GEORGIA: A NATIONAL CROSS-SECTIONAL STUDY.....	404-422

Alaa H. Alfarhan, Bahir S. Allawi, Mohammed A. Aljodah, Ahmed Jawad. MINIMALLY INVASIVE FAT TRANSPOSITION IN LOWER BLEPHAROPLASTY	423-427
Ospanova Meruyert, Ospanova Saniya, Yernazarov Adilet, Amanbaev Rauan, Rakhmankulov Umarali. LOW-FREQUENCY ULTRASOUND AND OZONE/NO TECHNOLOGIES IN THE COMBINED TREATMENT OF EXUDATIVE HEMISINUSITIS USING THE YAMIK-3 SINUS CATHETER.....	428-432
Sodikjon Mashraf Ugli Makhmatkulov, Ibragimova Malika Shavkatovna, Khasanov Alisher Yurevich, Mavlyanova Zilola Farkhadovna, Khalimova F.T, Marwan Ismail. COMBINED BOTULINUM TOXIN THERAPY AND PERCUTANEOUS TIBIAL NERVE STIMULATION IN THE REHABILITATION OF WOMEN WITH URGENCY URINARY INCONTINENCE ASSOCIATED WITH DIABETES MELLITUS.....	433-444
Nellia Veretova, Alfiya Samigullina, Aigul Baialieva, Ruslan Abdyldaev, Begimai Muratbekova. PSYCHONEUROLOGICAL THERAPY FOR POST-COVID SYNDROME: A COMPREHENSIVE REVIEW OF METHODS AND CLINICAL EFFECTIVENESS.....	445-451
Azhar Giniyat, Natalya Slivkina, Viktor Tkachev, Gulbana Khussainova, Ayan Baigaliyev, Sara Kubekova, Aizat Seidakhmetova, Zilola Mavlyanova, Mirbanu Aikhodzheyeva, Raikhan Burumbaeva, Larissa Pavlovets, Raikhan Tleulinova, Raushan Baigenzheyeva, Mereke Alaidarova, Joseph Almazan, Aizhan Altynbekova, Bakyt Zhangabulova, Zinugul Baissova, Manzura Kankina, Parida Pirmanova, Magira Shaizadinova, Aliya Utenova, Zhansaya Raiymkul. DEVELOPMENT AND EVALUATION OF A NURSE-LED SELF-DIRECTED PEDIATRIC REHABILITATION MODEL: COMPARATIVE ANALYSIS OF INTERNATIONAL PRACTICES.....	452-465
Florina Sahiti, Argjira Veseli, Marija Peeva Petreska, Shera Kosumi, Nora Berisha, Enis Veseli, Kaltrina Veseli. BIOMARKERS OF BONE REMODELING AND INFLAMMATION IN CHRONIC PERIAPICAL LESIONS: A NARRATIVE REVIEW	466-473

SOME BIOLOGICAL CHARACTERISTICS ASSOCIATED WITH GESTATIONAL DIABETES

J. Gobadze^{1*}, M. Nagervadze¹, T. Gogitidze², N. Bejanidze³, T. Koiava¹.

¹Batumi Shota Rustaveli State University, Batumi, Georgia.

²Batumi International University (BAU), Faculty of Medicine, Batumi, Georgia.

³Bau International Hospital (BIH), Batumi, Georgia.

Abstract.

This study investigated the relationships between specific biological factors and the risk of gestational diabetes mellitus (GDM). A retrospective case-control study was conducted in pregnant women with GDM and in healthy pregnant women who served as a control group. ABO and Rh blood groups, maternal age, pre-pregnancy and third-trimester body mass index (BMI), and first-trimester thyroid-stimulating hormone (TSH) and free thyroxine (FT4) levels were analyzed in both groups. Associations were assessed using the chi-square (χ^2) test, together with odds ratios (OR) and 95% confidence intervals (CI). Our research shows no significant association between ABO or Rh blood groups and the risk of GDM. Advanced maternal age is a moderate risk factor for GDM (OR = 1.92, 95% CI: 1.07–3.42, $\chi^2 = 8.16$, $p = 0.043$). Elevated maternal BMI was strongly associated with GDM risk OR = 13.98, 95% CI: 4.8 – 40.9, $\chi^2 = 43.40$, and $P < 0.0001$. FT4 imbalance was more prevalent among women with GDM (OR = 3.34, 95% CI: 1.72–6.55, $\chi^2 = 14.29$, $p = 0.0008$). TSH alterations were associated with GDM to a lesser extent.

Our research shows that maternal age, BMI, and FT4 imbalance emerged as relevant risk factors for the development of GDM. ABO and Rh blood groups did not appear to be independent contributors to GDM. Early identification of such risk factors is essential for the timely management and prevention of GDM.

Key words. Body mass index, blood group, gestational diabetes mellitus, thyroid function.

Introduction.

Pregnancy is a normal physiological process that, in certain cases, is complicated by pathological conditions such as GDM, hypertensive disorders, miscarriage, preterm labor, placental disorders, hemolytic disease, infections, and anemia [1,2], etc. Each of these conditions has a genetic predisposition and/or nongenetic risk factors. One of the most common metabolic disorders of pregnancy is GDM, which is characterized by glucose intolerance and is typically first identified in the second and third trimesters of gestation. Numerous studies indicate that women with GDM have an approximately tenfold higher risk of developing type 2 diabetes mellitus (T2DM) than women with normoglycemic pregnancies, with T2DM generally manifesting 10–20 years after delivery [3].

The molecular-biological and epidemiological mechanisms of GDM have not been fully studied. Although they have been characterized in certain populations, data remain limited in others, including Georgia. The prevalence of GDM has risen steadily in recent years. GDM is well known to be associated with advanced maternal age, and its risk increases with overweight and obesity; lifestyle is also a major potential contributor.

The investigation of additional biological and clinical factors associated with GDM is therefore of considerable importance [4,5].

GDM is a multifactorial disorder driven by pregnancy-induced physiological insulin resistance together with an inadequate compensatory capacity of pancreatic β -cells. Genetic predisposition also contributes in some major cases, but genetic factors alone cannot account for the development of GDM or its individual clinical presentation. Various metabolic, hormonal, and other biological parameters play an important role in glucose regulation during pregnancy. Assessing these factors is valuable because several can be readily measured during routine clinical evaluation.

Thyroid hormones play a central role in regulating metabolic reactions in the living body. TSH and FT4 affect insulin sensitivity and glucose metabolism. The abnormal quantitative characteristics of hormones can cause various metabolic disorders that affect both maternal health and fetal development. This underscores the importance of studying the qualitative and quantitative characteristics of thyroid hormones [6].

Attention has also been directed toward other biomarkers. ABO and Rh blood groups may be associated with various disorders and metabolic and physiological characteristics, including inflammatory processes and metabolic risk profiles. The clear, detailed explanations of the mechanisms underlying these possible associations are not yet fully understood, and investigating these markers across different populations may provide further insight into the biological context of GDM.

Given the multifactorial nature of GDM and the potential interrelationships among biological parameters, a comprehensive assessment of clinically accessible indicators of maternal metabolic and hormonal status is warranted. The aim of the current study was to evaluate selected biological characteristics associated with GDM. Some of them are: ABO and Rh blood groups, thyroid hormones (TSH and FT4), and BMI. The integrated analysis of these factors is intended to improve understanding of the biological characteristics of GDM and to identify parameters that may play an important role in evaluating the course of pregnancy and perinatal outcomes.

Materials and Methods.

Possible risk factors for GDM were investigated using questionnaire data collected in 2024–2025. The "BAU - International Hospital, Batumi Clinic" and Batumi Shota Rustaveli State University bases were used to collect, analyze, and synthesize the research data. The study was approved by the Clinical Ethics Commission Order №15/09/2024, I/C S/K 445412152. This retrospective case-control study included 220 pregnant women divided into two groups of 110: a control

group (healthy pregnant women) and a study group (women with GDM). Our control and research groups included 110-110 pregnant women each. During the research process, scientific and clinical consultation was provided by a doctor-endocrinologist. Data collection began on September 20th, 2024, and continued for approximately 10 months, ensuring a consistent and diverse selection of cases.

The inclusion criterion for the control group was health status. The pregnant women in this group had no metabolic, endocrine, or other complex pathology. Women in the control group had normal glucose metabolism, and had no history or diagnosis of GDM during the index pregnancy. The inclusion criterion for the study group was clinically confirmed GDM, diagnosed on the basis of laboratory data and clinical assessment. In accordance with the American College of Obstetricians and Gynecologists (ACOG) guidelines and prenatal care protocols in Georgia, screening for gestational diabetes is performed at 26 weeks' gestation. The pregnant woman is given a 50 g oral glucose load, and plasma glucose is measured 1 hour later. If the 1-hour glucose exceeds 140 mg/dL, a 100 g oral glucose tolerance test (OGTT) is performed. The 100 g OGTT includes a fasting glucose measurement and measurements at 1, 2, and 3 hours after the load. Gestational diabetes is diagnosed if two or more of the four measurements are elevated.

Additional inclusion criteria were also determined, including normal pregnancy through the first trimester, as well as a separate criterion of adulthood (≥ 18 years) and written informed consent to participate in the research study. As for the exclusion criteria, they included chronic diseases, multiple pregnancies, and pre-diabetes.

Both the group pregnant women and GDM women received antenatal care at the same clinic during the same study period. Controls were selected consecutively from the same source population as the cases to ensure comparability and to minimize selection bias. Other matching between groups was performed during the research. All pregnant women were under 18 years of age. For both groups, data were evaluated over the same gestational periods: BMI was assessed both before pregnancy and at 38–39 weeks of gestation, whereas thyroid hormones (TSH and FT4) were assessed only in the first trimester.

As noted, thyroid hormones were assessed only once, in the first trimester, in both groups. Ideally, they would also have been evaluated at other stages of pregnancy, and the absence of such data is a limitation of the present study. Under the free screening program of the Adjara health-care system, thyroid hormones are measured in all pregnant women during the first trimester; if a disorder is confirmed, treatment is initiated, and hormone levels are subsequently monitored in each trimester. Because these follow-up data were not available for the control group, a comparison across trimesters was not possible, and these data were therefore not analyzed.

The research questionnaire included demographic data of the pregnant women (age, body mass, and height) and immunogenetic biomarkers (ABO blood groups and Rh factors). Because one aim of the study was to assess the possible association between BMI and GDM, data on body mass and height were required. BMI index was calculated by the nurse at the clinic. In line with clinical protocol, the first measurement

is recorded when the medical record is opened, using a device that measures height and weight simultaneously, and BMI is reassessed at different stages of gestation to monitor normal or excessive weight gain. The body mass index was calculated using a special formula: $BMI = \text{kg}/\text{m}^2$, as we can see, the ratio of body mass (kg) to height (m^2) is needed to calculate the body mass index.

The data on pregnant women were statistically processed. For comparative analysis, the χ^2 test and P value were used. This allowed us to determine the statistical significance of the differences between the groups under study. $p < 0.05$ is considered statistically significant. Odds Ratios (OR) were also calculated to quantify the extent to which a given factor increased or decreased the risk of GDM, using the formula $OR = (a \times d) / (b \times c)$ for 2×2 category. The 95% CI measure was also derived using the logarithmic method: $SE = \sqrt{1/a + 1/b + 1/c + 1/d}$.

Processing of the received data was also carried out according to multivariable logistic regression, a special statistical program (Jamovi) was used for data processing.

Results.

A total of 110 pregnant women with GDM were studied. The disease was diagnosed at the 26th week of gestation. The gold standard for GDM diagnosis is 24–28 weeks of gestation, when the glucose tolerance test is performed [7]. This period of pregnancy is characterized by the maximum influence of placental hormones and a peak of physiological insulin resistance.

The distribution of ABO blood groups was studied both in the GDM and control groups. Among women with GDM, the O(I) blood group was found in $39.09 \pm 4.72\%$ case ($n=43$), A(II) blood group in $46.36 \pm 4.76\%$ case ($n=51$), and B(III) blood group in $10.91 \pm 3.09\%$ case ($n=12$), AB(IV) blood group was observed in $3.64 \pm 1.86\%$ case ($n=4$). The distribution of data in the control group, was as follows, namely: 50 pregnant women were found to have O(I) group ($50 \pm 4.74\%$), A(II) group was found to 40 pregnant women ($36.36 \pm 4.67\%$), B(III) blood group has 13 healthy pregnant women ($11.82 \pm 3.20\%$), As for AB(IV) blood group only 2 pregnant women ($1.82 \pm 1.33\%$) were observed. The prevalence of ABO blood groups among pregnant women with GDM and healthy pregnant women was statistically similar (Table 1).

The ABO/Rh blood group combinations were also analyzed. Among women with GDM, $35.45 \pm 4.65\%$ had O(I)Rh+ blood group ($n=39$), and $3.64 \pm 1.86\%$ had O(I)Rh- ($n=4$); $41.82 \pm 4.75\%$ had A(II)Rh+ ($n=46$) and $4.54 \pm 2.07\%$ had A(II)Rh- ($n=5$); $10 \pm 2.98\%$ had B(III)Rh+ ($n=11$) and $0.91 \pm 0.94\%$ had B(III)Rh- ($n=1$); and $3.64 \pm 1.86\%$ had AB(IV)Rh+ ($n=4$). No case of AB(IV)Rh among the studied groups was observed (Table 2).

The distribution of ABO/Rh blood combinations in healthy pregnant women is as follows: the O(I)Rh+ blood group is the most prevalent ($44.54 \pm 4.76\%$). O(I)Rh- blood group is distributed in $5.45 \pm 2.26\%$ cases ($n=6$); A(II)Rh+ blood group combination is presented in $33.64 \pm 4.60\%$ case ($n=37$), A(II)Rh- in 2.73 ± 1.62 ($n=3$); B(III)Rh+ in $10 \pm 2.98\%$ ($n=11$) and B(III)Rh- in $1.82 \pm 1.33\%$; 2 pregnant women have AB(IV)Rh+

(1.82±1.33%), No case of AB(IV)Rh⁻ was observed (Table 2). Overall, the distribution of ABO/Rh blood groups was similar across the study cohort.

Participants were then categorized by age. In the GDM group there were 10 women aged 18–25 (9.09±2.86%), 59 aged 26–35 (53.64±4.68%), 39 aged 36–45 (35.45±4.65%), and 2 aged 46–55 (1.82±1.33%) out of the total number of GDM pregnant women. The distribution differed in the control group: 5 women were aged 18–25 (4.54±2.07%), 79 were aged 26–35 (71.82±3.88%), and 26 were aged 36–45 (23.64±4.18%). The advanced-age (46–55 years) category is absent from the healthy group. The result is statistically significant (Table 3).

For the Odds Ratio (OR) calculation, participants were dichotomized into those aged ≥35 years and those aged <35 years. The data were distributed as follows: 69 women <35 years in the GDM cohort and 84 in the healthy cohort. ≥35 years GDM - 41 and 29 in the healthy cohort (Table 4). OR=1.92 (95% CI: 1.07 – 3.42). Maternal age ≥35 years was significantly associated with an increased risk of GDM (Table 4).

First-trimester TSH levels were within the normal range (0.2–2.5 mIU/L) in the majority of women in both groups: 73.64±3.74% of women with GDM (n=81) and 79.09±3.21% of controls (n=87), indicating that thyroid function was largely preserved in both groups. TSH <0.2 mIU/L (an index predisposing to hyperthyroidism) is four times more common in those with GDM (3.64±1.87%) than in healthy pregnant women (0.91±0.95%). This may indicate that thyroid hyperactivity is relatively more frequent in GDM. TSH >2.5 mIU/L (subclinical hypothyroidism zone) was similar in the two groups, with a slight excess in women with GDM (22.72±4.12%) compared with healthy women (20±3.95%) (Table 5). It should be noted that subclinical hypothyroidism is often associated with metabolic disorders, including insulin resistance and GDM. In pregnant women with GDM, extremely low and high TSH values are slightly more common than in healthy women. This may indicate that an imbalance of thyroid function is somewhat related to the GDM. Most women in both groups fell within the normal range, indicating that TSH alterations represent only one contributing factor rather than a direct cause. The TSH distribution in the first trimester does not differ and is not a statistically significant indicator (Table 5).

A low FT4 level (<0.61 ng/dL) is significantly more frequent in the GDM group (12.73±3.31 %) than in healthy pregnant women (2.73±1.63 %). GDM women are much more likely to have subclinical or overt hypothyroidism. Low FT4 levels are often associated with insulin resistance and impaired glucose homeostasis, which may contribute to GDM. Normal FT4 (0.61–1.12 ng/dL): the majority of healthy pregnant women are within the normal range (86.36±2.08%); in those with GDM, this indicator is significantly lower (65.45±4.28%). This gives us the basis to say that hormonal homeostasis is more stable in healthy pregnant women than in those with GDM. As for high FT4 (>1.12 ng/dL) in patients with GDM, it is twice as common (21.82±4.07%) as in healthy pregnant women (10.91±3.09%) (Table 6).

For the OR calculation, FT4 was dichotomized as abnormal (low or high) versus normal (Table 7). Abnormal FT4 levels were strongly associated with GDM (OR = 3.34, 95% CI: 1.72–

6.55), indicating a more than threefold increased risk (Table 7).

The distribution of BMI differed significantly between GDM and healthy pregnant women. BMI was analyzed at two time points: before pregnancy and in the last period of pregnancy (38–39 weeks). Before pregnancy, 3.64±1.86% of the GDM group and 5.45±2.26% of the healthy group were underweight. Notably, no cases of underweight were recorded at 38–39 weeks, indicating that physiological weight gain during pregnancy was sufficient to prevent underweight.

Before pregnancy, 36 women in the GDM group and 78 in the healthy group were classified as having normal weight. At 38–39 weeks, normal weight was maintained by only 5 women with GDM (4.54±2.07%) but by 19 women from healthy pregnancies (17.27±3.74%), showing that normal weight was more common among healthy women and declined markedly by the end of pregnancy in the GDM group. 32 pregnant women in the GDM group (29.09±4.44%) and 22 pregnant women in the healthy group (20±3.93%) were overweight before pregnancy. At 38–39 weeks, this indicator in the GDM group was 16 (14.55±3.49%), and in healthy pregnant women, it increased sharply to 50 (45.45±4.76%). Based on the comparison, being overweight at the end of pregnancy is more common in the healthy group, likely reflecting physiological gestational weight gain, whereas in the GDM group, more weight is classified as obesity. 38 pregnant women (34.54±4.62%) were obese before pregnancy in the GDM group, and only 4 (3.64±1.86%) in healthy pregnant women. At 38–39 weeks, obesity increased sharply in the GDM group and amounted to 89 pregnant women (80.91±2.98%).

As we can see, obesity in the healthy group increased to 41 pregnant women (37.28±4.68%) (Table 8). This indicates that in pregnant women with GDM, obesity is much more pronounced, both before pregnancy and especially at the end of pregnancy. The data also show that from early pregnancy onward, overweight and obesity are considerably more common in the GDM group than in healthy pregnant. At 38–39 weeks, the difference becomes even more pronounced, and obesity is more prevalent in the GDM group. The healthy group is characterized by normal weight and overweight, whereas the GDM group is dominated by obesity. Underweight was no longer observed in either group at the end of pregnancy, consistent with normal physiological weight gain. Statistics indicate the difference between the studied groups. Obesity thus emerges as one of the most important risk factors for GDM, as it clearly predominates in the GDM group because falling into this category in the GDM group in both periods, before pregnancy and in the late period of pregnancy (Table 8).

Clinically, it can be divided into 2 categories: Obese (BMI >30) and Non-obese (BMI ≤30). OR ≈ 13.98 (~14). 95% CI: 4.8 – 40.9. Statistics have shown a very strong association: obesity increases the risk of GDM by approximately 14-fold. Because the CI does not include 1, this association is highly statistically significant, confirming obesity as a major risk factor for GDM (Table 9).

As can be seen from the multivariable logistic analysis, Deviance=243, and AIC=253, as for R²McF=0.205, which indicates that the data well describes the probability of developing GDM considering various factors, as for the factors directly affecting GDM, statistical values were observed with

Table 1. ABO blood groups of healthy and GDM pregnant women.

ABO blood group	GDM pregnant women		Healthy pregnant women		χ^2	P
	n	%	n	%		
O(I)	43	39.09±4.72	55	50±4.74	3.51	0.32
A(II)	51	46.36±4.76	40	36.36±4.67		
B(III)	12	10.91±3.09	13	11.82±3.20		
AB(IV)	4	3.64±1.86	2	1.82±1.33		
Total	110	100	110	100		

Table 2. ABO/Rh blood combinations in the targeted groups.

ABO and Rh	GDM		Healthy pregnant		χ^2	P
	n	%	n	%		
O(I)Rh+	39	35.45%±4.65	49	44.54%±4.76	4.51	0.61
O(I)Rh-	4	3.64%±1.86	6	5.45%±2.26		
A(II)Rh+	46	41.82%±4.75	37	33.64%±4.60		
A(II)Rh-	5	4.54%±2.07	3	2.73%±1.62		
B(III)Rh+	11	10%±2.98	11	10%±2.98		
B(III)Rh-	1	0.91%±0.94	2	1.82%±1.33		
AB(IV)Rh+	4	3.64%±1.86	2	1.82%±1.33		
AB(IV)Rh-	0	0%±0	0	0%±0		
Total	110	100%	110	100%		

Table 3. The age of the targeted pregnant women.

age	GDM		Healthy control		χ^2	P
	N	%	n	%		
18-25	10	9.09%±2.86	5	4.54%±2.07	8.16	0.043
26-35	59	53.64%±4.68	79	71.82%±3.88		
36-45	39	35.45%±4.65	26	23.64%±4.18		
46-55	2	1.82%±1.33	0	0%±0		
Total	110	100	110	100		

Table 4. Two age (≥ 35 and < 35) categories in the studied group.

Age	GDM	Healthy
≥ 35	41	26
< 35	69	84

Table 5. TSH in the first trimester of the studied groups.

TSH In I trimester	GDM		Healthy controls		χ^2	P
	N	%	N	%		
<0.2	4	3.64%±1.87	1	0.91%±0.95	2.21	0.33
0.2-2.5	81	73.64%±3.74	87	79.09%±3.21		
>2.5	25	22.72%±4.12	22	20%±3.95		
total	110	100%	110	100%		

Table 6. The level of FT4 in the studied groups.

FT4	GDM		Healthy controls		χ^2	P
	N	%	n	%		
<0.61	14	12.73%±3.31	3	2.73%±1.63	14.29	0.0008
0.61-1.12	72	65.45%±4.28	95	86.36%±2.08		
>1.12	24	21.82%±4.07	12	10.91%±3.09		
Total	110	100%	110	100%		

Table 7. The level of FT4 in the target group.

FT4	GDM	Healthy
Abnormal	38	15
Normal	72	95

#OR = 3.34, 95% CI: 1.72–6.55

Table 8. BMI in GDM and healthy pregnant women.

BMI	GDM pregnant women				Healthy pregnant women				χ^2	P
	Before pregnancy		38-39 weeks		Before pregnancy		38-39 weeks			
	n	%	n	%	n	%	n	%		
Underweight BMI<18.5	4	3.64%± 1.86	0	-	6	5.45%± 2.26	0	-	43.40	< 0.0001
Normal weight BMI18.5-24.9	36	32.73%±4.57	5	4.54%± 2.07	78	70.91%±3.94	19	17.27%±3.74		
Overweight BMI25-29.9	32	29.09%±4.44	16	14.55%±3.49	22	20%± 3.93	50	45.45%±4.76		
Obesity BMI>30	38	34.54%±4.62	89	80.91%±2.98	4	3.64%± 1.86	41	37.28%±4.68		
Total	110	100%	110	100%	110	100%	110	100%		

Table 9. BMI in the studied groups.

BMI	GDM	Healthy
Obese (BMI >30)	38	4
Non-obese (≤30)	72	106

Table 10. Binomial Logistic Regression.

Model Fit Measures			
Model	Deviance	AIC	R ² _{McF}
1	243	253	0.205

Note. Models estimated using sample size of N=220

Model Coefficients – GDM				
Predictor	Estimate	SE	Z	p
Intercept	-9.9025	1.7357	-5.71	<.001
AGE	0.0474	0.0304	1.56	.119
BMI	0.2179	0.0367	5.93	<.001
TSH	0.1340	0.1238	1.08	.279
FT4	3.0316	0.8260	3.67	<.001

Note. Estimates represent the log odds of "GDM = 1" vs. "No GDM = 0"

BMI ($p < 0.001$) and FT4 ($P < 0.001$), and age ($P = 0.119$) and TSH ($P = 0.279$) do not appear to be a statistically significant factor (Table 10).

Discussion.

Early screening and prevention of GDM are of considerable clinical importance. In our study, the ABO blood group was not associated with GDM: the distribution did not differ significantly between the groups ($\chi^2 = 3.51$, $p = 0.32$), indicating that ABO blood group is not an independent risk factor for GDM. Our results were compared with findings from other scientific papers (Bahkali et al., 2022a, 2022b; Erum Saleem et al., 2025). A similar study was done in Saudi Arabia, which enrolled pregnant women with GDM but no history of type 1 or type 2 diabetes Mellitus, likewise found no association between ABO blood group and GDM [8]. In contrast, a study in Pakistan, in which all participants underwent GDM screening, reported that women with an Rh-positive blood group had an increased risk of GDM, whereas those with the AB blood group had a lower incidence of GDM (Erum Saleem et al., 2025). During the analysis and synthesis of related scientific papers, we noted that results varied across nationalities and ethnic groups. For

example, AB blood group pregnant women have a low risk of GDM in the Israeli population (Rom et al., 2022). Despite the strong interest in the association between ABO blood type and GDM, the evidence that ABO blood type may predispose to GDM remains incomplete and unconfirmed. The article describes a retrospective, population-based study that examined a large cohort of pregnant women and observed the association between ABO blood group and GDM. The women included in the study underwent a two-stage screening and were confirmed to have GDM; terminated pregnancies were excluded in the study. The results of the study revealed that the AB blood group was less associated with the risk of GDM than other blood groups, and the study also confirmed that there was virtually no difference in the Rh factor between the GDM and control groups [9]. There are alternative findings. The study included 30,740 participants. The participants were selected from the Center for Obstetrics and Gynecology of Beijing Hospital in China. The study reported that the AB blood group was a more significant risk factor for GDM, conferring an approximately twofold higher risk [10]. This heterogeneity is often attributable to differences in ethnic composition, sample size, diagnostic criteria, and data-collection methodology.

There is no association with the Rh blood group. In our study, women with and without GDM had the same Rh distribution ($\chi^2 = 0.004$, $p = 1$), indicating that the Rh factor is not an independent risk factor for the development of GDM. There was also no difference in the prevalence of ABO/Rh combinations in the studied groups. These results are consistent with other studies reporting that the Rh factor does not influence the development of GDM [11]. In one study, all women who gave birth at the Lille University Medical Center in France between August 1, 2017, and February 28, 2018, were screened for GDM using the method recommended in the French national guidelines. The risk of GDM was estimated for ABO and Rh blood groups using logistic regression models. The study did not find the Rh factor as an independent risk factor for the development of GDM. According to the study, the Rh factor exhibited relatively high-risk properties only in combination with the AB blood group [11].

Age is among the potential risk factors for the development of GDM in pregnant women. Our results show statistically significant differences in the studied group ($\chi^2 = 8.16$, $p = 0.043$). The age category is heterogeneous among pregnant women with GDM. The advanced age of the pregnancy increases the risk of GDM. These findings are consistent with other epidemiological studies, many of which support advanced maternal age as an independent risk factor for GDM [12,13]. In this direction, meta-analytic studies are conducted using three electronic databases to identify scientific publications relevant to the topic mentioned. OR and 95% confidence interval (95% CI) were calculated. Subgroup and meta-regression analyses were performed to study the sources of heterogeneity identified between studies. This meta-analysis found that the risk of GDM increased linearly across age groups [14]. Similarly, a multicenter cohort study in Japan involving 72,270 pregnant women found that advanced maternal age was associated with an increased risk of GDM, regardless of the timing of diagnosis, with a comparable association for early and late GDM [13]. Advanced maternal age is known to increase insulin resistance and thereby reduce tissue sensitivity to glucose. In addition, increasing age also causes various metabolic disorders in mothers, which can also contribute to the development of GDM. Increasing age may be associated with insulin resistance, decreased pancreatic β -cell function, and metabolic changes that may contribute to the development of GDM.

The analysis of TSH levels in the 1st trimester of gestation in the GDM and control groups doesn't show significant associations. This is consistent with studies suggesting that a slight first-trimester TSH imbalance (subclinical hypothyroidism or hyperthyroidism) may be associated with metabolic disorders, as well as insulin resistance and the risk for GDM development. However, because the bulk fell within the normal range, changes in thyroid function appear to be only a partial, contributory determinant of GDM rather than an independent one (Li et al., 2021; Luo et al., 2021; Pinto et al., 2023; Rawal et al., 2018). TSH imbalance in the first trimester can be considered a concomitant risk factor but not a major determinant of the development of GDM. For this reason, further prospective studies are warranted to clarify the role of thyroid dysfunction in the development of GDM [15].

The present study showed that FT4 levels differed significantly between women with GDM and controls. A low FT4 level (<0.61 ng/dL) was present in 12.73% of women with GDM versus 2.73% of controls, whereas a normal FT4 (0.61 – 1.12 ng/dL) was far more common in controls (86.36%) than in women with GDM (65.45%). A low FT4 indicates a predisposition to subclinical or overt hypothyroidism, which may be associated with insulin resistance, metabolic imbalances, and impaired glucose homeostasis, all of which increase the risk of development of GDM [16]. In addition, a high FT4 level (>1.12 ng/dL) was twice as common in women with GDM as in controls (21.82% vs. 10.91%), which may reflect both increased carbohydrate metabolism and thyroid hyperactivity [17].

Both hypothyroidism and hyperthyroidism have been associated with an increased risk of GDM (Shahbazian et al., 2013; Wu et al., 2023). A small cohort study in Iran that included 64 pregnant women found that hypothyroidism was strongly associated with an increased risk of GDM, whereas the risk associated with hyperthyroidism was smaller [18]. A study in China involving 27,184 pregnant women found that both hyperthyroidism and hypothyroidism were associated with the risk of GDM, with a particularly high risk in hyperthyroidism [19]. Notably, the high proportion of normal FT4 levels in healthy pregnant women indicates that thyroid function is more stable in these women, whereas changes in hormonal homeostasis are more pronounced in GDM group. FT4 imbalance is often the cause and an independent risk factor for the development of GDM, especially when accompanied by insulin resistance and metabolic changes.

Our combined analysis of TSH and FT4 shows that the majority of both groups, both GDM and healthy pregnant women, are within the normal range, although deviations are more frequent in pregnant women with GDM ($\chi^2=16.49$, $p=0.0056$), possibly reflecting hyperactivity and accelerated carbohydrate metabolism. These findings are consistent with studies indicating that changes in FT4 are more strongly associated with GDM, whereas TSH is relatively inert and less closely related to GDM [20,21]. The study was a prospective, multicentre study of singleton pregnancies at 15 centres in the United States. Patients were recruited between 10 3/7 and 13 6/7 weeks of gestation. All subjects had a live singleton intrauterine pregnancy without evidence of anencephaly, as confirmed by ultrasound at the time of study enrolment. The study excluded women whose fetuses were affected by Down syndrome or other chromosomal structural abnormalities. This study found that changes in FT4 were closely associated with an increased risk of GDM, whereas changes in TSH had less impact on the development of GDM [20]. A further study, conducted between 2009 and 2013 in a multi-ethnic, multicentre cohort, included 2,334 non-obese and 468 overweight women aged 18–40 years at 8–13 weeks of gestation. Data were collected from 12 clinical centers in the United States and were followed throughout pregnancy. Exclusion criteria included hypertension, diabetes, autoimmune kidney disease, psychiatric disorders, cancer, and AIDS. The study found an association between FT4 and GDM, particularly in the first trimester [21].

As a thyroid hormone, FT4 influences the quantitative control of glucose and, accordingly, the so-called insulin resistance, and

changes in its level may themselves increase the risk of GDM. The same cannot be said of TSH, which does not participate directly in tissue metabolic processes; its association with GDM risk is therefore weak, if not negligible. Consequently, monitoring FT4 in the first trimester may be an important preventive measure, particularly in women at high risk of GDM.

The BMI data show that a high BMI, and obesity in particular (BMI >30), was far more common in pregnant women with GDM, both before pregnancy and at 38-39 weeks of pregnancy, whereas normal BMI is more common in healthy pregnant women, which supports the idea that high BMI is relatively rare in the healthy group. Similar results are also found in other studies, according to which high BMI before pregnancy or early pregnancy sharply increases the risk of developing GDM [14,22]. The study was conducted in China, and the cohort included 17,145 pregnant women enrolled between 15 and 20 weeks of gestation. The results of the study showed that overweight and obesity before pregnancy, and an increase in gestational body mass index from conception to 15-20 weeks of gestation and beyond, were correlated with an increased risk of GDM. Public health measures may help prevent excessive gestational weight gain [14]. A Norwegian study of 24,198 pregnant women between 2006 and 2014, which followed first and second pregnancies, found that the risk of GDM increased with weight gain from the first to the second pregnancy, and was more pronounced in women with a body mass index < 25 during the first pregnancy [22]. The results suggest that weight change is a metabolic mechanism underlying the increased risk of GDM; therefore, weight change should be recognized as an independent factor for GDM screening in clinical guidelines. Promoting a healthy weight from the prenatal period to the postpartum period should be the general goal.

With a high BMI, the body shows greater insulin resistance, which, in turn, leads to elevated glucose levels. In addition, pregnancy is characterized by hormonal changes that affect the effectiveness of insulin, and accordingly, when these are superimposed on a high BMI, the risk of developing a so-called metabolic imbalance increase, which ultimately leads to an increased risk of developing GDM. The high rates of obesity in the GDM group demonstrate a strong association between BMI and GDM risk, with statistically significant differences both before pregnancy and at 38-39 weeks. A population-based cohort study in Sweden, including 131,164 pregnancies, found that the risk of GDM increased with weight gain [23]. A cross-sectional US study conducted from 2011 to 2019, including 11,950,881 live singleton births to women aged 15-44 years, reported that the population-attributable fraction of obesity-related GDM has increased significantly over the past decade, highlighting the importance of optimizing prepregnancy weight [24].

Study Limitations.

Several limitations of the present study should be acknowledged. First, the sample was relatively small: the total of 220 participants did not allow reliable evaluation of less frequent characteristics, such as the AB and Rh-negative blood groups. Larger multicenter studies are required to confirm these findings. Second, the study was conducted at a single clinic in western Georgia, which may limit the generalizability

of the results to the wider pregnant population of the country or to populations with different demographic and ethnic characteristics. Third, thyroid hormones (TSH and FT4) were measured only during the first trimester, so their variation across the whole of gestation could not be assessed. Finally, the retrospective case-control design does not permit causal inferences between the biological characteristics examined and the development of GDM; the observed associations should therefore be interpreted as correlations rather than evidence of causality.

Conclusion.

Our research shows that maternal age, BMI, and FT4 imbalance are general risk factors for GDM. ABO and Rh blood groups do not appear to be independent contributors to GDM. Research of this kind, together with the early identification of additional potential risk factors, is essential for the prevention of GDM. The research findings emphasize the need for the early identification and control of risk factors to prevent GDM and improve pregnancy outcomes.

Acknowledgements.

The authors gratefully acknowledge Batumi Shota Rustaveli State University and the BAU International Hospital for providing the facilities and support for clinical data collection during this study.

Declaration of interest.

The authors declare no conflict of interest.

REFERENCES

1. Huang S, Guo Y, Xu X, et al. Gestational diabetes complicated with preterm birth: a retrospective cohort study. *BMC Pregnancy Childbirth*. 2024;24:631.
2. Wambua S, Singh M, Okoth K, et al. Association between pregnancy-related complications and development of type 2 diabetes and hypertension in women: an umbrella review. *BMC Med*. 2024;22:66.
3. Rayanagoudar G, Hashi AA, Zamora J, et al. Quantification of the type 2 diabetes risk in women with gestational diabetes: a systematic review and meta-analysis of 95,750 women. *Diabetologia*. 2016;59:1403-11.
4. ElSayed NA, Aleppo G, Aroda VR, et al. 15. Management of Diabetes in Pregnancy: Standards of Care in Diabetes-2023. *Diabetes Care*. 2023;46:S254-66.
5. Wang Y, Lu S, Xu X, et al. The interactive effects of pre-pregnancy body mass index, thyroid function, and blood lipid levels on the risk of gestational diabetes mellitus: a crossover analysis. *BMC Pregnancy Childbirth*. 2022;22:580.
6. Yanachkova V, Kamenov Z. The relationship between thyroid dysfunction during pregnancy and gestational diabetes mellitus. *Endokrynol Pol*. 2021;72:226-231.
7. Kunarathnam V, Vadakekut ES, Mahdy H. *Gestational Diabetes*. StatPearls, Treasure Island (FL): StatPearls Publishing; 2026.
8. Bahkali N, Eissa G, Sindi H, et al. Association Between ABO Blood Group and Gestational Diabetes Mellitus in Pregnant Women at King Abdulaziz University Hospital: A Retrospective Study. *Cureus*. 2022;14:e31784.

9. Rom E, Yogeve M, Sela N, et al. The association between ABO blood groups and gestational diabetes mellitus: a retrospective population-based cohort study. *J Matern-Fetal Neonatal Med Off J Eur Assoc Perinat Med Fed Asia Ocean Perinat Soc Int Soc Perinat Obstet.* 2022;35:7065-9.
10. Xie SH, Li SY, Su SF, et al. Association between ABO Blood Types and the Risk of Gestational Diabetes Mellitus: A Prospective Cohort Study. *Biomed Environ Sci BES.* 2025;38:678-692.
11. Lemaitre M, Passet M, Ghesquière L, et al. Is the Development of Gestational Diabetes Associated with the ABO Blood Group/ Rhesus Phenotype? *Front Endocrinol.* 2022;13:916903.
12. Li Y, Ren X, He L, et al. Maternal age and the risk of gestational diabetes mellitus: A systematic review and meta-analysis of over 120 million participants. *Diabetes Res Clin Pract.* 2020;162:108044.
13. Tagami K, Iwama N, Hamada H, et al. Advanced maternal age is a risk factor for both early and late gestational diabetes mellitus: The Japan Environment and Children's Study. *J Diabetes Investig.* 2025;16:735-43.
14. Li G, Wei T, Ni W, et al. Incidence and Risk Factors of Gestational Diabetes Mellitus: A Prospective Cohort Study in Qingdao, China. *Front Endocrinol.* 2020;11.
15. Fernández Alba JJ, Castillo Lara M, Jiménez Heras JM, et al. High First Trimester Levels of TSH as an Independent Risk Factor for Gestational Diabetes Mellitus: A Retrospective Cohort Study. *J Clin Med.* 2022;11:3776.
16. Jelloul E, Lomré M, Kleynen P, et al. Low FT4 levels in early pregnancy are associated with higher insulin therapy need in women with gestational diabetes mellitus. *Eur Thyroid J.* 2026;15:ETJ250206.
17. Saini JS, Narula AS, Khati C, et al. CARBOHYDRATE METABOLIC DISTURBANCES IN HYPERTHYROIDISM. *Med J Armed Forces India.* 1996;52:149-152.
18. Shahbazian H, Shahbazian N, Rahimi Baniani M, et al. Evaluation of thyroid dysfunction in pregnant women with gestational and pre-gestational diabetes. *Pak J Med Sci.* 2013;29:638-641.
19. Wu J-N, Pérez-López FR, Peng T, et al. Association of Early Pregnancy Free and Total Triiodothyronine with the Subsequent Risk of Gestational Diabetes Mellitus. *Endocr Pract Off J Am Coll Endocrinol Am Assoc Clin Endocrinol.* 2023;29:40-47.
20. Haddow JE, Craig WY, Neveux LM, et al. Free Thyroxine During Early Pregnancy and Risk for Gestational Diabetes. *PloS One.* 2016;11:e0149065.
21. Rawal S, Tsai MY, Hinkle SN, et al. A Longitudinal Study of Thyroid Markers Across Pregnancy and the Risk of Gestational Diabetes. *J Clin Endocrinol Metab.* 2018;103:2447-56.
22. Sorbye LM, Skjaerven R, Klungsoyr K, et al. Gestational diabetes mellitus and interpregnancy weight change: A population-based cohort study. *PLoS Med.* 2017;14:e1002367.
23. Xu H, Hutcheon JA, Liu X, et al. Risk of gestational diabetes mellitus in relation to early pregnancy and gestational weight gain before diagnosis: A population-based cohort study. *Acta Obstet Gynecol Scand.* 2022;101:1253-1261.
24. Wang MC, Shah NS, Petito LC, et al. Gestational Diabetes and Overweight/Obesity: Analysis of Nulliparous Women in the U.S., 2011-2019. *Am J Prev Med.* 2021;61:863-871.