GEORGIAN MEDICAL NEWS

ISSN 1512-0112

NO 9 (378) Сентябрь 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 ВИНИТИ 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 ВИНИТИ 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. Корректура авторам не высылается, 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 compu-ter-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 საყურადღებოდ!

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, 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 შეღებვის 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 ფჩხილებში 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.

GEORGIAN MEDICAL NEWS
NO 9 (378) 2026

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PREVALENCE AND RISK FACTORS OF PELVIC ORGAN PROLAPSE AMONG WOMEN IN ALMATY: A HOSPITAL-BASED STUDY

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Abstract.

Introduction: Pelvic organ prolapse (POP) is a common pelvic floor disorder in women and can substantially affect quality of life. Data on the prevalence and associated factors of POP in Kazakhstan remain limited. This study aimed to assess the prevalence and factors associated with clinically confirmed POP among women examined at a medical center in Almaty.

Materials and Methods: This hospital-based study included 1,500 women aged 28–55 years. POP was assessed by gynecological examination using the POP-Q system. Demographic, obstetric, lifestyle, and clinical factors were evaluated. Crude and age-specific prevalence was calculated, and multivariable logistic regression was used to identify factors independently associated with POP. Internal validation was performed using 1,000 bootstrap resamples.

Results: The prevalence of clinically confirmed POP was 30.7% (460/1,500). Age-specific prevalence was 32.9% at 28–37 years, 31.3% at 38–47 years, and 27.5% at 48–55 years. Cystocele was the predominant anatomical component (81.7%). Higher BMI, birth trauma, instrumental delivery, fetal birth weight ≥3,700 g, chronic cough, constipation, single lifting of >10 kg, and family history were independently associated with POP. The final model showed moderate discrimination (AUC=0.799, 95% CI 0.774–0.824), with an optimism-corrected AUC of 0.793.

Conclusion: Clinically confirmed POP was present in 30.7% of women in this hospital-based cohort. Several obstetric, lifestyle, and clinical factors were independently associated with POP. These findings provide initial data for planning future population-based studies of POP in Kazakhstan.

Key words. Pelvic organ prolapse, prevalence, risk factors, Kazakhstan, women's health, logistic regression.

Introduction.

Pelvic organ prolapse (POP) is a common pelvic floor disorder in women and can significantly affect quality of life [1-6]. According to a recent systematic review and meta-analysis, the overall prevalence of POP is approximately 30.9%, although estimates vary considerably depending on the study population and diagnostic method [7]. Prevalence based on questionnaire assessment was approximately 25%, whereas studies using clinical examination reported substantially higher rates [7]. Considerable variation has also been observed between countries, highlighting the influence of diagnostic methods, study populations, and healthcare settings on reported prevalence [7]. To date, data on the prevalence of POP in Kazakhstan remain limited.

Our previous research showed an increase in the number of surgical interventions for POP in Almaty and Kazakhstan between 2014 and 2021 [8]. However, surgical activity cannot be considered a direct measure of disease prevalence, as it is influenced by access to specialized care, referral patterns, patient awareness, and healthcare organization. Our earlier work also indicated the importance of timely detection, preventive measures, pelvic floor muscle training, and lifestyle modification in the management of women at risk of POP [8].

Several factors have been associated with POP, including age, obesity, obstetric history, birth trauma, high birth weight, chronic cough, constipation, and physical activity involving heavy lifting [9-20]. Genetic susceptibility and lifestyle-related factors may also contribute to the development of POP [9,13]. Although the relative contribution of individual factors varies between populations, POP is generally considered a multifactorial condition resulting from the interaction of obstetric, anatomical, lifestyle, and clinical factors [9,13,15].

Our previous study of women after surgical treatment for POP identified several factors associated with recurrence, including increased BMI, low protein intake, vitamin D deficiency, constipation, heavy lifting, smoking, duration of menopause, and lack of regular medical follow-up [8]. These findings provided a basis for further investigation of factors associated with primary POP.

Therefore, this study aimed to estimate the prevalence of clinically confirmed POP among women examined at a medical center in Almaty and to examine demographic, obstetric, lifestyle, and clinical factors associated with POP.

Materials and Methods.

A hospital-based cross-sectional study was conducted at LS Clinic Medical Center, Almaty, Kazakhstan, between October 2021 and June 2025, and included 1,500 women. Women aged 18 years and older were eligible for inclusion; however, the actual age of the enrolled participants ranged from 28 to 55 years. The study protocol was approved by the Local Bioethics Committee of the Kazakhstan Medical University "Higher School of Public Health" (Protocol No. 1). According to institutional requirements, ethical approval is granted for one year and renewed annually; the latest approval was issued on October 2, 2024. The study was conducted as part of a doctoral

research project; however, this component was not included in the final version of the dissertation.

All participants were recruited and examined at LS Clinic Medical Center. Based on clinical examination, two groups were formed: the main group (Group 1, n=460), comprising women with clinically confirmed pelvic organ prolapse (POP), and the control group (Group 2, n=1,040), comprising women without POP.

Inclusion criteria: female sex, age ≥18 years, written informed consent, and a history of at least one childbirth.

Exclusion criteria: malignant or benign pelvic neoplasms that could affect pelvic anatomy and interfere with the assessment of pelvic organ support.

Sample size:

In the absence of reliable population-based estimates of POP prevalence in Kazakhstan, an anticipated prevalence of 4% was used for the sample-size calculation. This planning assumption was consistent with the epidemiological evidence synthesis by Barber and Maher (2013), conducted within the Fifth International Consultation on Incontinence [21-23]. Although published in 2013, this publication represented a relevant and established synthesis of the epidemiological evidence available at the time of study planning and reported POP prevalence estimates within a range that included the selected 4% planning value.

The minimum sample size was calculated using the standard formula for estimating a single proportion:

$n = Z^2 \times p \times (1 - p) / d^2$

where Z = 1.96 for a 95% confidence level, p = 0.04 was the anticipated prevalence, and d = 0.01 was the specified absolute margin of error.

Accordingly:

$n = 1.96^2 \times 0.04 \times (1 - 0.04) / 0.01^2 = 1475.17$, which was rounded up to 1,476 participants.

Thus, the calculated minimum sample size was 1,476 women. The planned sample was rounded upward to 1,500 participants to account for possible participant withdrawal during the study, incomplete assessments, or missing data.

The prevalence of POP in the hospital-based study sample was calculated as the proportion of women with clinically confirmed POP among all examined participants. For age-stratified analysis, participants were grouped according to their actual age distribution into three categories: 28–37, 38–47, and 48–55 years. Age-specific prevalence was calculated as the number of women with POP divided by the total number of examined women in the corresponding age group and expressed as a percentage.

Data collection:

Data were collected using a study-specific 31-item questionnaire and clinical examination. The collected variables included age, body weight and height with calculation of body mass index (BMI), reproductive and obstetric history, including the number of deliveries, abortions and cesarean sections, menopausal status, smoking status, physical activity, heavy lifting, prolonged physical strain, family history of POP, and selected comorbidities, including varicose veins, hernias at other anatomical sites, and hemorrhoids.

Functional pelvic floor disorders were also assessed, including stress urinary incontinence, voiding difficulties, fecal and flatus incontinence, sexual dysfunction, and defecatory difficulties. Dietary characteristics, including the reported intake of protein-rich and sugar-rich foods, were assessed using the questionnaire.

In a subset of participants, serum vitamin D3 levels (ng/mL) were measured to assess vitamin D status. Pelvic organ support was assessed by clinical examination, and the stage of prolapse was determined according to the international Pelvic Organ Prolapse Quantification (POP-Q) system. In women with POP, quality of life was additionally assessed using the Prolapse Quality of Life Questionnaire (P-QOL) adapted for use in the Kazakhstani population [10].

Definition and coding of exposure variables:

Variables included in the multivariable model were defined using clinical and questionnaire-based criteria. Age (years), parity (number of deliveries), and body mass index (BMI, kg/m²) were analyzed as continuous variables. Menopausal status was recorded as a binary variable (0 = no, 1 = yes).

Birth trauma was defined as a history of obstetric perineal trauma during vaginal delivery and was coded as 0 = no and 1 = yes. Fetal birth weight ≥3700 g was coded as 0 = no and 1 = yes. The 3700-g threshold was selected on the basis of previously reported POP-specific evidence [11] and was used as an obstetric exposure threshold rather than as a conventional definition of fetal macrosomia.

Chronic cough was considered present in women reporting chronic respiratory disease accompanied by persistent or frequently recurrent prolonged cough and was coded as 0 = no and 1 = yes. Constipation was assessed based on characteristic symptoms, including straining, lumpy or hard stools, a sensation of incomplete evacuation or anorectal obstruction, manual maneuvers to facilitate defecation, and reduced stool frequency (<3 spontaneous bowel movements per week), and was coded as 0 = no and 1 = yes.

Family history of POP was considered positive when POP was reported in a first-degree female relative (mother, sister, or daughter) and was coded as 0 = no and 1 = yes. Single lifting of >10 kg was classified as heavy physical lifting and was coded as 0 = no and 1 = yes. The 10-kg threshold was based on the national occupational regulations of the Republic of Kazakhstan establishing the maximum permissible load for occasional manual lifting and carrying by women [24].

Statistical analysis:

Statistical analyses were performed using R version 4.6.1 (R Foundation for Statistical Computing, Vienna, Austria). Quantitative variables were assessed for normality using the Shapiro–Wilk test and compared using Student's t-test or the Mann–Whitney U test, as appropriate. Categorical variables were compared using Pearson's chi-square test or Fisher's exact test. Cramér's V was used to assess the strength of associations.

Potential factors associated with POP were initially assessed using univariable binary logistic regression. Clinically relevant variables with $p<0.05$ were entered into a multivariable logistic regression model using backward Wald selection (removal criterion $p>0.10$). Age, parity, and menopausal status were retained irrespective of statistical significance. Abortion history

was removed during backward selection. Vitamin D was not included in the multivariable analysis because laboratory measurements and factors affecting vitamin D levels, including diet and supplementation, were not standardized.

Adjusted odds ratios (aORs) with 95% CIs were reported. Multicollinearity was assessed using VIF, and model fit using Nagelkerke R^2. Model discrimination was assessed by ROC analysis. Internal validation was performed using 1,000 bootstrap resamples with calculation of the optimism-corrected AUC. A p-value <0.05 was considered statistically significant.

Results.

The overall prevalence of clinically confirmed POP in the hospital-based study sample was 30.7% (460/1,500). This estimate represents the proportion of POP cases among women examined at the study center and includes both symptomatic and asymptomatic prolapse.

Age-stratified analysis showed that POP was present in 167 of 507 women aged 28–37 years (32.9%), 165 of 528 women aged 38–47 years (31.3%), and 128 of 465 women aged 48–55 years (27.5%). The prevalence of POP was therefore relatively similar across the examined age groups, ranging from 27.5% to 32.9%.

Additional analysis of obstetric characteristics across age groups showed no difference in parity (p=0.926). Reported fetal birth weight ≥3,700 g was more frequent among women aged 28–37 years (27.6%) than among those aged 38–47 years (20.8%) and 48–55 years (20.6%) (p=0.012).

The distribution of the study population and POP cases according to age is presented in Table 1.

Table 2 presents the anatomical forms of pelvic organ prolapse and functional pelvic floor disorders among women with confirmed POP (Group 1, n=460).

Isolated cystocele was the most common anatomical form, observed in 138 women (30.0%). Considering isolated and combined forms, cystocele was present in 81.7% of cases. Cystocele was combined with rectocele in 105 women (22.8%) and with apical prolapse in 69 (15.0%). Anterior-apical prolapse was identified in 55 women (12.0%), while all three compartments were involved in 64 (13.9%). Apical prolapse combined with rectocele was observed in 18 women (3.9%), isolated rectocele in 9 (2.0%), and no specific anatomical form was identified in 2 (0.4%).

Functional disorders were common and could coexist. Sexual dysfunction was reported by 46.1% of women, defecatory difficulties by 35.0%, stress urinary incontinence by 27.0%, voiding difficulties by 21.1%, and fecal and flatus incontinence by 5.0%. Overall, 51.0% reported none of the functional symptoms assessed.

The mean P-QOL score was 20.12, with considerable variability among women with POP, reflecting differences in the impact of prolapse on quality of life.

Figure 1 shows the frequencies of comorbid conditions associated with connective tissue dysplasia in two groups (prolapse group and control group).

Hemorrhoids: Group 1 — 33% (152 cases), Group 2 — 14% (145); $\chi^2 = 74.21$, $p < 0.001$, Cramér's V = 0.223. Hernias (other localizations): Group 1 — 11% (51 cases), Group 2 — 3% (31); $\chi^2 = 35.67$, $p < 0.001$, Cramér's V = 0.154. Varicose veins: Group 1 — 13% (60 cases), Group 2 — 6% (64); $\chi^2 = 21.26$, $p < 0.001$, Cramér's V = 0.119.

All listed conditions were significantly more frequent in women with prolapse. The strongest association was observed with hemorrhoids (moderate strength, Cramér's V = 0.223), which may indicate a shared pathogenetic predisposition related to connective tissue dysplasia.

The prolapse and control groups were comparable in terms of age, with no statistically significant differences between them. However, BMI was significantly higher in the prolapse group compared to the control group: 24.4 ± 4.41 versus 23.03 ± 3.78, respectively ($p < 0.001$). Vitamin D3 levels also differed significantly between groups: in the prolapse group a deficiency was observed (14.83 ± 4.85), whereas in the control group levels indicated insufficiency (24.91 ± 6.88) ($p < 0.001$) (Table 3).

The association between the selected factors and the probability of pelvic organ prolapse is described by the following multivariable logistic regression equation:

$P = 1 / (1 + \exp(-z)) * 100\%$

$z = -3.996 + 0.004 * XAge + 0.020 * XParity - 0.412 * XMenopause + 0.448 * XBT + 1.430 * XID + 0.061 * XBMI + 1.592 * XFH + 0.368 * XSL + 1.178 * XC + 1.034 * XCC + 0.976 * XLF$

P - estimated probability of pelvic organ prolapse (%); XAge - age (years); XParity - number of deliveries; XMenopause - menopausal status (0 - no, 1 - yes); XBT - birth trauma (0 - no, 1 - yes); XID - instrumental delivery (0 - no, 1 - yes); XBMI - body mass index (kg/m2); XFH - family history of pelvic organ prolapse (0 - no, 1 - yes); XSL - single lifting >10 kg (0 - no, 1 - yes); XC - constipation (0 - no, 1 - yes); XCC - chronic cough (0 - no, 1 - yes); XLF - fetal birth weight >=3700 g (0 - no, 1 - yes).

A multivariable logistic regression analysis was performed to assess factors independently associated with POP. The adjusted model included age, parity, menopausal status, BMI, birth trauma, instrumental delivery, fetal birth weight ≥3700 g, chronic cough, constipation, single lifting of >10 kg, and family history of POP. Age, parity, and menopausal status were retained as clinically relevant covariates irrespective of statistical significance. The complete results are presented in Table 4.

Higher BMI, birth trauma, instrumental delivery, fetal birth weight ≥3700 g, chronic cough, constipation, single lifting of >10 kg, and family history of POP were independently associated with higher odds of POP (Table 4, Figure 2). Each 1 kg/m² increase in BMI was associated with a 6% increase in the odds of POP (aOR 1.06, 95% CI 1.03–1.10). Women with a history of birth trauma had 1.57-fold higher odds of POP (95% CI 1.20–2.05), while instrumental delivery was associated with 4.18-fold higher odds (95% CI 2.63–6.65). Fetal birth weight ≥3700 g was associated with 2.65-fold higher odds of POP (95% CI 1.99–3.54). Chronic cough and constipation were associated with 2.81-fold (95% CI 2.09–3.78) and 3.25-fold (95% CI 2.46–4.29) higher odds, respectively. Single lifting of >10 kg was associated with 1.44-fold higher odds (95% CI 1.10–1.89), whereas family history of POP showed the strongest association, with 4.91-fold higher odds (95% CI 3.63–6.65). Age, parity, and menopausal status were not independently associated with POP after adjustment. VIF values ranged from 1.01 to 1.85, indicating no evidence of problematic multicollinearity.

Table 1. *Prevalence of pelvic organ prolapse according to age group.*

Age group (years)	Total examined, n	POP cases, n	Women without POP, n	POP prevalence within age group, %
28–37	507	167	340	32.9
38–47	528	165	363	31.3
48–55	465	128	337	27.5
Total	1,500	460	1,040	30.7

Table 2. *Distribution of anatomical forms of prolapse and functional disorders, impact on quality of life (Group 1, n=460).*

Anatomical forms of prolapse		
Isolated cystocele	138	30.0%
Cystocele + rectocele	105	22.8%
Cystocele + apical prolapse	69	15.0%
Anterior-apical prolapse	55	12.0%
All forms combined	64	13.9%
Apical prolapse + rectocele	18	3.9%
Isolated rectocele	9	2.0%
No anatomical prolapse	2	0,4%
Pelvic floor functional disorders		
Stress urinary incontinence	124	27.0%
Voiding difficulties	97	21.1%
Fecal and gas incontinence	23	5.0%
Defecation difficulties	161	35.0%
Sexual dysfunction*	212	46.1%
P-QOL: 20,12(95%ДИ: 1,13-37,12)		

Table 3. *Quantitative characteristics of the groups.*

Parameter	Group 1								
	M	SD±	Me	Q1–Q3	M	SD±	Me	Q1–Q3	
Age	41.76	8.12	42	35.0–48.0	42.13	8.17	43	35.0–49.0	–*
BMI	24.4	4.41	23.37	20.79–27.79	23.03	3.78	22.15	20.3–24.2	<0.001*
Vitamin D3	14.83	4.85	15.03	11.3–18.24	24.91	6.88	24.86	20.14–29.58	<0.001*
M – mean, SD – standard deviation, Me – median, Q1–Q3 – interquartile range, * – Student's t-test, ** – Mann–Whitney U - test.									

Table 4. *Multivariable logistic regression analysis of factors associated with pelvic organ prolapse.*

Variable	β	SE	aOR	95% CI	p-value	VIF
Age, years	0.004	0.011	1.00	0.98–1.03	0.692	1.84
Parity, number of deliveries	0.020	0.071	1.02	0.89–1.17	0.779	1.01
Menopausal status	−0.412	0.227	0.66	0.42–1.03	0.069	1.85
BMI, kg/m²	0.061	0.016	1.06	1.03–1.10	<0.001	1.01
Birth trauma	0.448	0.137	1.57	1.20–2.05	0.001	1.01
Instrumental delivery	1.430	0.237	4.18	2.63–6.65	<0.001	1.01
Fetal birth weight ≥3700 g	0.976	0.147	2.65	1.99–3.54	<0.001	1.03
Chronic cough	1.034	0.151	2.81	2.09–3.78	<0.001	1.02
Constipation	1.178	0.142	3.25	2.46–4.29	<0.001	1.02
Single lifting >10 kg	0.368	0.138	1.44	1.10–1.89	0.008	1.01
Family history of POP	1.592	0.154	4.91	3.63–6.65	<0.001	1.04
Intercept	−3.996	0.608	0.018	0.006–0.061	<0.001	—
Note: β – regression coefficient; SE – standard error; aOR – adjusted odds ratio; CI – confidence interval; VIF – variance inflation factor; BMI – body mass index; POP – pelvic organ prolapse. Binary exposure variables were coded as 0 = absent and 1 = present. Age, parity, and menopausal status were retained in the model as clinically relevant covariates.						

Table 5. *Performance and internal validation of the multivariable logistic regression model.*

Model performance measure	Result
Nagelkerke R^2	0.332
Apparent AUC (95% CI)	0.799 (0.774–0.824)
Bootstrap resamples	1,000
Mean bootstrap optimism	0.007
Optimism-corrected AUC	0.793
Exploratory Youden cut-off	0.293
Sensitivity at cut-off	73.0%
Specificity at cut-off	74.8%

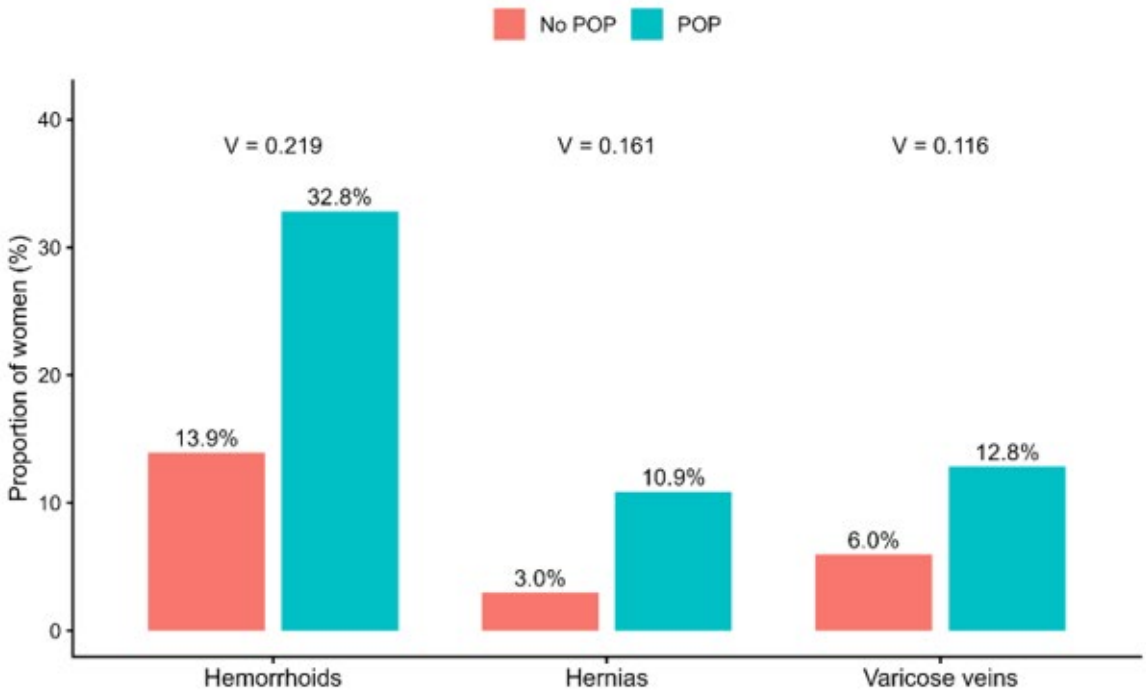


Figure 1. *Comorbidities likely associated with connective tissue dysplasia.*

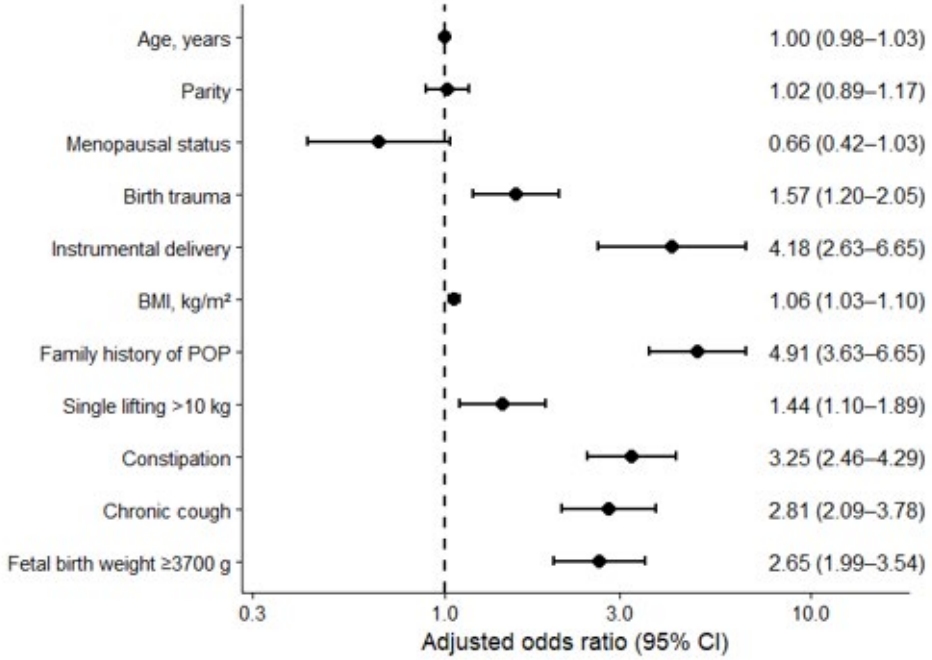


Figure 2. *Adjusted odds ratios (aORs) and 95% confidence intervals for factors associated with pelvic organ prolapse in the multivariable logistic regression model. The vertical dashed line indicates the null value (aOR = 1.0).*

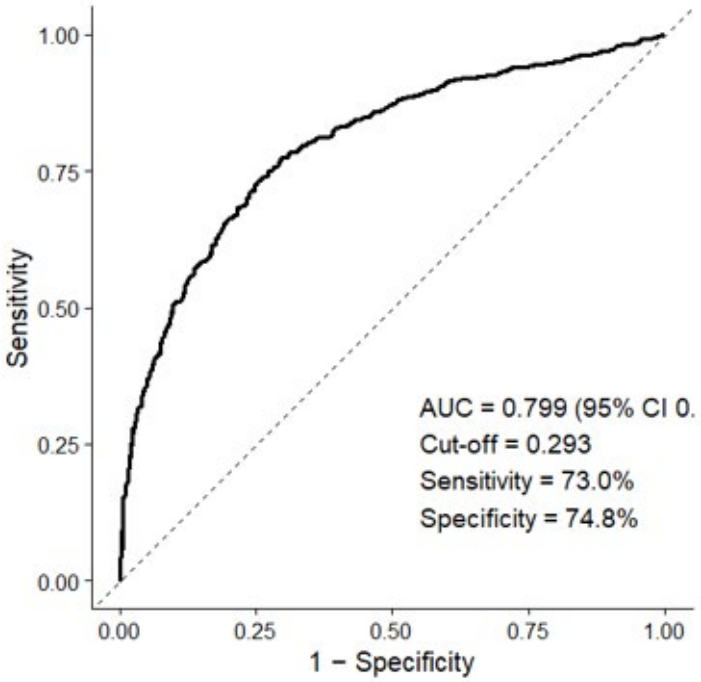


Figure 3. *Receiver operating characteristic (ROC) curve of the adjusted multivariable logistic regression model for pelvic organ prolapse.*

The adjusted model demonstrated moderate discrimination, with an apparent AUC of 0.799 (95% CI 0.774–0.824) and a Nagelkerke R^2 of 0.332 (Table 5). Internal validation using 1,000 bootstrap resamples showed low optimism (0.007), resulting in an optimism-corrected AUC of 0.793. At the exploratory Youden cut-off of 0.293, sensitivity was 73.0% and specificity was 74.8%. These performance estimates reflect internal discrimination within the present study sample and should not be interpreted as evidence of externally validated clinical predictive performance.

Receiver operating characteristic (ROC) analysis of the final multivariable logistic regression model yielded an apparent AUC of 0.799 (95% CI 0.774–0.824), indicating moderate discrimination between women with and without POP (Figure 3). The exploratory optimal cut-off determined using the Youden index was 0.293, corresponding to a sensitivity of 73.0% and a specificity of 74.8%. Following internal validation with 1,000 bootstrap resamples, the optimism-corrected AUC was 0.793.

Discussion.

In this hospital-based study of 1,500 women, the prevalence of clinically confirmed pelvic organ prolapse (POP) was 30.7% (460/1,500). All participants underwent gynecological examination, allowing identification of both symptomatic and asymptomatic POP. This is relevant because prevalence estimates based on clinical examination are generally higher than those obtained using symptom-based questionnaires alone [7].

POP prevalence was relatively similar across the examined age groups: 32.9% among women aged 28–37 years, 31.3% among those aged 38–47 years, and 27.5% among women aged 48–55 years. The slightly lower prevalence in the oldest group was unexpected. Additional analysis showed no difference in parity across age groups (p=0.926), whereas reported fetal birth weight ≥3,700 g was more frequent among women aged 28–37 years (27.6%) than among those aged 38–47 years (20.8%) and 48–55 years (20.6%) (p=0.012). This may partly explain the observed pattern, as fetal birth weight ≥3,700 g was independently associated with POP in the adjusted analysis. The 3,700-g threshold was based on previous POP-specific evidence [11]. However, the age-specific findings should be interpreted cautiously, particularly because birth weight was reported retrospectively.

Anatomically, cystocele was the predominant component of POP, occurring both alone and in combination with other forms. This predominance of anterior compartment involvement is consistent with previous studies examining obstetric, lifestyle, and physical factors associated with pelvic floor dysfunction [10,13,14,17,19,20].

Higher BMI, birth trauma, instrumental delivery, fetal birth weight ≥3,700 g, chronic cough, constipation, single lifting of >10 kg, and family history of POP remained independently associated with POP after adjustment. Each 1 kg/m² increase in BMI was associated with a 6% increase in the odds of POP. The strongest associations were observed for family history and instrumental delivery, followed by constipation, chronic cough, and fetal birth weight ≥3,700 g. These findings support the multifactorial nature of POP and are broadly consistent with previous studies of obstetric, lifestyle, and clinical factors [11,13,15,18].

Single lifting of >10 kg was associated with higher odds of POP. Previous studies have also reported associations between strenuous physical activity, heavy lifting, and pelvic floor disorders [10,14,19,20]. The >10 kg threshold used in this study corresponds to the maximum permissible load for occasional manual lifting and carrying by women established by the national occupational regulations of the Republic of Kazakhstan [24].

Age, parity, and menopausal status were not independently associated with POP after adjustment. These findings should be interpreted in the context of the other variables included in the model and the restricted age range of the study population.

Hemorrhoids, hernias, and varicose veins were more frequent among women with POP, with the strongest association observed for hemorrhoids (Cramér's V=0.219). These findings may indicate shared underlying susceptibility, although their cross-sectional nature does not allow conclusions regarding causal or pathogenetic relationships.

Strengths of the Study.

The main strengths of this study are the large sample of 1,500 women and the use of clinical examination to identify POP. The final sample exceeded the calculated minimum sample size, and all participants underwent objective gynecological examination rather than questionnaire-based assessment alone. This allowed identification of anatomical POP irrespective of the presence of symptoms. The study also assessed a broad range of demographic, obstetric, lifestyle, and clinical characteristics, providing new data on POP in a population for which epidemiological evidence remains limited.

Limitations of the Study.

This study was conducted at a single medical center and was not population based. Therefore, the prevalence of 30.7% reflects the examined hospital-based cohort and cannot be directly extrapolated to all women living in Almaty or Kazakhstan.

The actual age range of the participants was 28–55 years, although women aged 18 years and older were eligible for inclusion. Women outside this age range were not represented, and direct age standardization to the female population of Almaty was therefore not performed.

Several exposures were based on retrospective self-report and may be affected by recall or reporting bias. This is particularly relevant to obstetric history, including fetal birth weight, and to physical exposures such as heavy lifting. Recall bias may also have influenced the differences in reported fetal birth weight observed across age groups.

The cross-sectional design does not establish the temporal sequence of the observed associations and does not permit causal inference. In addition, although the multivariable model was internally validated using bootstrap resampling, external validation was not performed.

Despite these limitations, the present findings provide initial clinically based estimates of POP frequency and associated factors in Almaty. They may also inform the design of future population-based studies, including sample-size planning, selection of relevant exposure variables, and age-stratified recruitment. Such studies are needed to obtain representative and age-standardized estimates of POP prevalence in Almaty and Kazakhstan.

Conclusion.

This hospital-based study found a clinically confirmed POP prevalence of 30.7%. Higher BMI, birth trauma, instrumental delivery, fetal birth weight ≥3,700 g, chronic cough, constipation, single lifting of >10 kg, and family history were independently associated with POP. The final model showed moderate discrimination (AUC=0.799; optimism-corrected AUC=0.793).

These findings provide new data on POP in Almaty and may inform future population-based studies. Given the single-center design and the age range of 28–55 years, further studies with broader population coverage are needed to obtain representative prevalence estimates and confirm the observed associations.

Acknowledgments.

We express our gratitude to all women who participated in our study.

Funding.

No external funding.

Conflict of interest.

The authors confirm that this manuscript has not been published previously and is not currently under consideration for publication elsewhere.

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მენჯის ღრუს ორგანოების დაწევის გავრცელება და რისკ-ფაქტორები ქალებში ალმათიში: საავადმყოფოს ბაზაზე ჩატარებული კვლევა

რეზიუმე.

შესავალი: მენჯის ღრუს ორგანოების პროლაფსი (POP) ქალებში მენჯის ფსკერის გავრცელებული დარღვევაა, რომელსაც შეუძლია მნიშვნელოვნად გააუარესოს ცხოვრების ხარისხი. ყაზახეთში POP-ის გავრცელებისა და მასთან დაკავშირებული ფაქტორების შესახებ მონაცემები კვლავ შეზღუდულია. წინამდებარე კვლევის მიზანი იყო ალმათის სამედიცინო ცენტრში გამოკვლეულ ქალებში კლინიკურად დადასტურებული POP-ის გავრცელებისა და მასთან დაკავშირებული ფაქტორების შეფასება.

მასალები და მეთოდები: საავადმყოფოს ბაზაზე ჩატარებულ კვლევაში მონაწილეობდა 28–55 წლის 1 500 ქალი. POP შეფასდა გინეკოლოგიური გასინჯვისა და POP-Q სისტემის გამოყენებით. შესწავლილ იქნა დემოგრაფიული, სამეანო, ცხოვრების წესთან დაკავშირებული და კლინიკური ფაქტორები. გამოითვალა გავრცელების საერთო და ასაკობრივი მაჩვენებლები, ხოლო POP-თან დამოუკიდებლად დაკავშირებული ფაქტორების დასადგენად გამოყენებულ იქნა მრავალფაქტორული

ლოგისტიკური რეგრესია. შიდა ვალიდაცია ჩატარდა 1 000 bootstrap-რესემპლინგის გამოყენებით.

შედეგები: კლინიკურად დადასტურებული POP-ის გავრცელებამ შეადგინა 30,7% (460/1 500). ასაკობრივი გავრცელება იყო 32,9% 28–37 წლის ქალებში, 31,3% 38–47 წლის ქალებში და 27,5% 48–55 წლის ქალებში. ცისტოცელე იყო პროლაფსის ყველაზე გავრცელებული ანატომიური კომპონენტი (81,7%). სხეულის მასის მაღალი ინდექსი (BMI), მშობიარობისას მიღებული ტრავმა, ინსტრუმენტული მშობიარობა, ნაყოფის დაბადების წონა ≥3 700 გ, ქრონიკული ხველა, ყაბზობა, ერთჯერადად >10 კგ სიმძიმის აწევა და POP-ის ოჯახური ანამნეზი დამოუკიდებლად იყო დაკავშირებული POP-თან. საბოლოო მოდელმა აჩვენა ზომიერი დისკრიმინაციული უნარი (AUC=0,799; 95% CI 0,774–0,824), ხოლო ოპტიმიზმზე კორექტირებულმა AUC-მა შეადგინა 0,793.

დასკვნა: კლინიკურად დადასტურებული POP გამოვლინდა ამ საავადმყოფოს ბაზაზე შესწავლილი ქალების 30,7%-ში. რამდენიმე სამეანო, ცხოვრების წესთან დაკავშირებული და კლინიკური ფაქტორი დამოუკიდებლად იყო დაკავშირებული POP-თან. მიღებული შედეგები წარმოადგენს საწყის მონაცემებს ყაზახეთში POP-ის შემდგომი პოპულაციური კვლევების დაგეგმვისთვის.

საკვანძო სიტყვები: მენჯის ღრუს ორგანოების პროლაფსი, გავრცელება, რისკ-ფაქტორები, ყაზახეთი, ქალთა ჯანმრთელობა, ლოგისტიკური რეგრესია.