



VAGINAL BIOCECENOSIS IN ADOLESCENT GIRLS WITH ACUTE GYNECOLOGICAL DISORDERS: A PROSPECTIVE CLINICAL AND MICROBIOLOGICAL STUDY

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Abstract.

Background. Disorders of the vaginal microbiota represent a significant component of gynecological morbidity in adolescent girls. Despite the establishment of lactobacillus-dominated vaginal flora after menarche, inflammatory and dysbiotic changes may persist, particularly in patients with acute gynecological pathology.

Objective. To evaluate the characteristics of vaginal biocenosis in adolescent girls hospitalized with acute gynecological diseases and to identify signs of latent inflammatory processes in the presence of dominant lactoflora.

Materials and Methods. A prospective study of 61 adolescent girls hospitalized with acute gynecological conditions was conducted. All patients underwent bacteriological and bacterioscopic examination of vaginal discharge. Pubertal development, sexual activity, and clinical diagnoses were analyzed.

Results. Lactobacillus spp. dominated the vaginal microbiota in 59% of patients. However, bacterioscopic signs of inflammation, including leukocytosis, increased epithelial desquamation, and coccal flora, were detected in more than 65% of cases, even in the absence of pronounced clinical symptoms.

Conclusion. Adolescent girls with acute gynecological diseases often exhibit disturbances of vaginal biocenosis characterized by latent inflammation despite lactobacillary dominance. These findings highlight the need for comprehensive microbiological assessment and individualized therapeutic and rehabilitative strategies.

Keywords: adolescent girl, vaginal microbiota, biocenosis, lactobacilli, inflammation

БИОЦЕНОЗ ВЛАГАЛИЩА У ДЕВОЧЕК-ПОДРОСТКОВ С ОСТРЫМИ ГИНЕКОЛОГИЧЕСКИМИ ЗАБОЛЕВАНИЯМИ: ПРОСПЕКТИВНОЕ КЛИНИКО- МИКРОБИОЛОГИЧЕСКОЕ ИССЛЕДОВАНИЕ

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Аннотация.

Актуальность. Нарушения микробиоценоза влагалища занимают значительное место в структуре гинекологической заболеваемости у девочек-подростков. Несмотря на формирование лактобациллярной флоры после менархе, у пациенток с острыми гинекологическими заболеваниями могут сохраняться воспалительные и дисбиотические изменения.

Цель исследования. Изучить особенности биоценоза влагалища у девочек-подростков, госпитализированных с острыми гинекологическими заболеваниями, и выявить признаки

скрытого воспалительного процесса при наличии доминирующей лактофлоры. **Материалы и методы.** Проведено проспективное исследование 61 девочки-подростка с острыми гинекологическими заболеваниями. Всем пациенткам выполнены бактериологическое и бактериоскопическое исследования влагалищного, отделяемого с учётом стадии полового развития и клинического диагноза.

Результаты. У 59% пациенток доминирующей флорой влагалища являлись *Lactobacillus* spp. Однако более чем в 65% случаев выявлены микроскопические признаки воспаления при отсутствии выраженных клинических жалоб.

Заключение. У девочек-подростков с острыми гинекологическими заболеваниями даже при наличии лактобациллярной флоры отмечаются нарушения биоценоза влагалища со скрытым воспалительным процессом, что требует дополнительного обследования и коррекции.

Ключевые слова: девочка-подросток, влагалище, биоценоз, лактобактерии, воспаление

O'SMIR QIZLARDA O'TKIR GINEKOLOGIK KASALLIKLAR FONIDA QIN BIOTSENOZI: PROSPEKTIV KLINIK-MIKROBIOLOGIK TADQIQOT

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Dolzarbli. Qin mikrobiotsenozining buzilishlari o'smir qizlarda ginekologik kasalliklarning muhim qismini tashkil etadi. Menarxedan keyin laktobatsillyar flora shakllanishiga qaramay, o'tkir ginekologik kasalliklar fonida yashirin yallig'lanish jarayonlari saqlanib qolishi mumkin. **Tadqiqot maqsadi.** O'tkir ginekologik kasalliklar bilan shifoxonaga yotqizilgan o'smir qizlarda qin biotsenozining xususiyatlarini o'rganish va dominant laktoflora mavjudligida yashirin yallig'lanish belgilarini aniqlash.

Materiallar va usullar. 61 nafar o'smir qizda prospektiv klinik-mikrobiologik tadqiqot o'tkazildi. Barcha bemorlarda qin ajralmasining bakteriologik va bakteriotskopik tahlillari amalga oshirildi.

Natijalar. Bemorlarning 59% ida qin mikroflorasida *Lactobacillus* spp. ustunlik qildi, biroq 65% dan ortiq hollarda klinik belgilersiz yashirin yallig'lanish belgilariga ega mikroskopik o'zgarishlar aniqlandi.

Xulosa. O'smir qizlarda o'tkir ginekologik kasalliklar fonida laktobatsillyar flora saqlangan bo'lsa ham, qin biotsenozining yallig'lanish bilan kechuvchi buzilishlari kuzatiladi va bu holat qo'shimcha tekshiruv hamda individual davolashni talab qiladi.

Kalit so'zlar: o'smir qiz, qin, biotsenoz, laktobakteriyalar, yallig'lanish

Introduction. Inflammatory and dysbiotic disorders of the lower genital tract remain one of the most frequent and clinically significant problems in modern gynecology, particularly in pediatric and adolescent populations. According to epidemiological data, vaginal infections and disturbances of the vaginal microbiota account for a substantial proportion of gynecological morbidity worldwide, affecting not only reproductive-aged women but also girls during the pubertal transition [1]. In adolescents, these conditions are often underdiagnosed due to the paucity of overt clinical symptoms, insufficient gynecological vigilance, sociocultural barriers, and the tendency to attribute complaints to physiological pubertal changes rather than pathological processes [2]. The vaginal ecosystem represents a complex and dynamic biological system composed of microbial communities, epithelial structures, immune mediators, and hormonal influences. In healthy postmenarchal girls, the vaginal microbiota is typically dominated by acid-producing lactobacilli, which play a pivotal role in maintaining mucosal homeostasis, preventing colonization by opportunistic and pathogenic microorganisms, and modulating local immune responses [3]. The establishment of a lactobacillus-dominated biocenosis is closely associated with estrogenization of the vaginal epithelium during puberty, leading to glycogen accumulation in epithelial cells and subsequent fermentation by lactobacilli with lactic acid production [4].

However, despite the presence of lactoflora, disturbances of the vaginal microenvironment may still occur. Recent studies have demonstrated that the mere quantitative dominance of *Lactobacillus* spp. does not always equate to functional eubiosis, particularly in adolescents exposed to multiple biological, behavioral, and environmental risk factors [5]. Acute gynecological conditions such as ovarian apoplexy, adnexal torsion, salpingitis, dysfunctional uterine bleeding, and ovarian cysts may be accompanied by systemic inflammatory responses, stress-induced immunological shifts, and alterations in local mucosal defense mechanisms [6]. These factors can contribute to subtle but clinically relevant changes in the vaginal biocenosis, often manifesting as subclinical or latent inflammatory processes. The clinical relevance of such hidden inflammatory changes is substantial. Persistent low-grade inflammation of the vaginal mucosa during adolescence may predispose patients to recurrent infections, chronic pelvic inflammatory disease, menstrual disorders, impaired reproductive health, and unfavorable obstetric outcomes later in life [7]. Moreover, in the context of acute gynecological pathology requiring hospitalization, attention is often focused primarily on the primary surgical or medical diagnosis, while the condition of the vaginal microbiota remains insufficiently assessed and corrected.

In Uzbekistan, including the Samarkand region, there is a growing emphasis on improving adolescent reproductive health as part of national healthcare priorities. The Department of Gynecology of Samarkand State Medical University actively integrates clinical research into educational and therapeutic processes, aiming to align local clinical practice with international evidence-based standards while considering regional epidemiological and sociocultural characteristics. Nevertheless, data on the vaginal biocenosis of adolescent girls with acute gynecological diseases in Central Asia remain limited, highlighting the need for focused prospective studies. The present study was designed to evaluate the characteristics of vaginal biocenosis in adolescent girls hospitalized with acute gynecological conditions, with particular emphasis on the presence of inflammatory changes in cases where lactobacilli remain the dominant microbial component. By combining clinical, bacteriological, and bacterioscopic data, this research aims to contribute to a more nuanced understanding of vaginal microbiota disturbances in this vulnerable population and to substantiate the necessity for comprehensive diagnostic and rehabilitative approaches.

Materials and Methods. This prospective observational study was conducted in accordance with ethical standards for biomedical research involving minors and was approved by the local ethics committee. The study population consisted of 61 adolescent girls who were hospitalized with acute gynecological diseases in the surgical department (gynecological beds) of a multidisciplinary pediatric hospital. The clinical and methodological framework of the study corresponds to the educational and research standards of the Department of Gynecology of Samarkand State Medical University. The inclusion criteria encompassed girls aged 12 to 17 years with confirmed acute gynecological pathology requiring inpatient management. Patients with known congenital anomalies of the genital tract, diagnosed immunodeficiency states, or recent use of systemic antibiotics or probiotics within four weeks prior to hospitalization were excluded from the study to minimize confounding factors affecting the vaginal microbiota.

All participants underwent a comprehensive clinical evaluation, including detailed medical history, assessment of pubertal development according to Tanner staging, gynecological examination adapted to age and sexual activity status, and standard laboratory investigations. Particular attention was paid to menstrual history, age at menarche, sexual activity, contraceptive practices, and the presence or absence of subjective vaginal symptoms. Microbiological assessment of the vaginal environment included both bacterioscopic and bacteriological analyses of vaginal discharge. Vaginal smears were obtained under sterile conditions prior to the initiation of any antimicrobial or surgical treatment. Bacterioscopy was performed using light microscopy with evaluation of leukocyte count per high-power field, epithelial cell desquamation, presence of coccal or mixed flora, and overall smear cleanliness. Bacteriological cultures were carried out to identify dominant microbial groups and quantify bacterial titers, with a diagnostic threshold of $\geq 10^3$ colony-forming units per milliliter for dominance. The average age of the patients at the time of examination was 14.7 ± 1.76 years. The interval since menarche ranged from 3 months to 3 years in the majority

of cases. Data were systematically recorded and analyzed using descriptive statistical methods. The results are presented as absolute numbers and percentages, reflecting the clinical distribution within the study cohort. To enhance transparency and originality, selected data are summarized in analytical tables embedded within the text.

Results. The clinical and developmental characteristics of the study population revealed that most patients were in the early to mid-postmenarchal period. Specifically, 57 out of 61 girls, representing 93.4% of the cohort, had experienced menarche within the preceding three months to three years. This period is known to be characterized by ongoing hormonal fluctuations and incomplete stabilization of the hypothalamic–pituitary–ovarian axis, which may influence both systemic and local immune responses [8]. Assessment of sexual maturation showed that 20 patients, accounting for 32.8%, had reached Tanner stage V, indicating full pubertal development. Eighteen girls, or 29.5% of the cohort, reported being sexually active. Among them, only 10 patients consistently used barrier contraception, while the remaining individuals either used no protection or relied on non-barrier methods. Notably, three sexually active girls reported having more than one sexual partner, a factor known to increase the risk of alterations in vaginal microbiota and inflammatory conditions [9]. The spectrum of acute gynecological diagnoses observed in the study reflects the heterogeneity of conditions requiring hospitalization in adolescent gynecology. Mixed or painful forms of ovarian apoplexy were the most frequent diagnosis, accounting for 40.9% of cases. Salpingitis in various stages of clinical progression was diagnosed in 13.1% of patients. Dysfunctional uterine bleeding of the pubertal period was identified in 8.2%, while unspecified ovarian cysts accounted for 13.5% of cases. Dysmenorrhea and adnexal torsion were each observed in 6.5% of patients.

Table 1. Distribution of acute gynecological diagnoses in the study cohort (n = 61)

Diagnosis	Number of patients (n)	Percentage (%)
Ovarian apoplexy (mixed or painful form)	25	40.9
Salpingitis	8	13.1
Ovarian cyst (unspecified)	8	13.5
Abnormal uterine bleeding of puberty	5	8.2
Dysmenorrhea	4	6.5
Adnexal torsion	4	6.5

Microbiological analysis revealed that in 36 patients, corresponding to 59% of the cohort, *Lactobacillus* spp. constituted the dominant vaginal flora at titers of 10^3 CFU/mL or higher. This finding would traditionally be interpreted as indicative of a relatively preserved vaginal biocenosis. However, clinical correlation suggested a more complex picture. Subjective complaints related to vaginal discharge were remarkably rare. Only one patient, representing 1.6% of the cohort, reported intermittent purulent vaginal discharge. The absence of pronounced clinical symptoms in the majority of patients underscores the diagnostic challenge of identifying subclinical vaginal inflammation in adolescents.

Despite the apparent dominance of lactoflora, bacterioscopic examination demonstrated signs of inflammatory changes in more than 65% of vaginal smears. These changes included an increased number of leukocytes per field of view, enhanced desquamation of epithelial cells, altered leukocyte-to-epitheliocyte ratios, and the presence of coccal flora alongside lactobacilli. Such findings are consistent with a latent inflammatory process that may not be reflected in patient-reported symptoms.

Table 2. Bacterioscopic characteristics of vaginal smears in patients with dominant *Lactobacillus* spp. (n = 36)

Bacterioscopic parameter	Frequency of abnormal findings (%)
Increased leukocyte count per field of view	>65
Excessive epithelial desquamation	>60
Altered leukocyte-to-epitheliocyte ratio	>55
Presence of coccal flora	>50

These results indicate that the presence of lactobacilli alone does not preclude inflammatory alterations of the vaginal mucosa in adolescents with acute gynecological diseases.

Discussion. The findings of the present study provide compelling evidence that vaginal biocenosis disturbances in adolescent girls with acute gynecological pathology are more complex than traditionally assumed. The detection of inflammatory changes in the vaginal environment despite the dominance of *Lactobacillus* spp. challenges the conventional dichotomous classification of vaginal microbiota into “normal” and “pathological” based solely on microbial composition [10]. From a pathophysiological perspective, several mechanisms may underlie this phenomenon. Acute gynecological diseases are frequently associated with systemic stress responses, including activation of the hypothalamic–pituitary–adrenal axis, transient immunosuppression, and alterations in cytokine profiles [11]. These systemic changes may compromise local mucosal immunity, rendering the vaginal epithelium more susceptible to inflammatory reactions even in the presence of protective lactoflora. Furthermore, adolescence represents a transitional period during which hormonal regulation is inherently unstable. Fluctuating estrogen levels can affect glycogen availability, epithelial turnover, and the functional activity of lactobacilli, potentially leading to qualitative changes in lactic acid production and antimicrobial peptide secretion [12]. As a result, lactobacilli may persist quantitatively while their protective capacity is functionally diminished. Behavioral factors, including early sexual activity, inconsistent use of barrier contraception, and exposure to multiple sexual partners, further contribute to microecological instability. Although only a subset of patients in this study was sexually active, the observed association between sexual behavior and inflammatory markers aligns with existing literature emphasizing the vulnerability of adolescent vaginal microbiota to external influences [13]. The clinical implications of these findings are significant. Latent vaginal inflammation may serve as a reservoir for ascending infection, exacerbate existing gynecological pathology, and negatively affect postoperative recovery and long-term reproductive outcomes. In the context of adolescent gynecology, where preventive strategies and early intervention are paramount, reliance on symptomatic assessment alone is insufficient. The results of this study support the necessity of incorporating routine microbiological and bacterioscopic evaluation of vaginal discharge into the diagnostic algorithm for adolescent girls hospitalized with acute gynecological conditions. Such an approach aligns with the educational and clinical principles advocated by the Department of Gynecology of Samarkand State Medical University, emphasizing comprehensive patient assessment and individualized care. The data underscore the importance of developing tailored therapeutic and rehabilitative strategies that address not only the primary gynecological diagnosis but also the restoration of vaginal microecological balance. This may include targeted antimicrobial therapy, immunomodulatory interventions, and probiotic support based on microbiological findings [14].

Conclusion. The present prospective study demonstrates that adolescent girls with acute gynecological diseases frequently exhibit disturbances of vaginal biocenosis characterized by latent inflammatory changes, even when lactobacilli remain the dominant microbial component. The absence of pronounced clinical symptoms in most patients highlights the limitations of symptom-based diagnostics and underscores the value of microbiological assessment. These findings indicate that the dominance of *Lactobacillus* spp. should not be interpreted as an unequivocal marker of vaginal health in adolescents, particularly in the context of acute gynecological pathology. Patients in this category require comprehensive diagnostic evaluation and the implementation of therapeutic and rehabilitative measures informed by microbiological data. Integration of such approaches into clinical practice at tertiary care institutions and academic departments, including the Department of Gynecology of Samarkand State Medical University, may contribute to improved short- and long-term reproductive health outcomes in adolescent girls.

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