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NEW DAY IN MEDICINE

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BIOCHEMICAL CHARACTERISTICS OF PATIENTS WITH CERVICAL CANCER

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✓ ***Resume***

This article highlights the importance of investigating biochemical parameters in patients with cervical cancer. The analysis of biochemical markers is essential for assessing metabolic alterations, oxidative stress, and inflammatory processes, as well as identifying changes associated with the clinical course of the disease. The findings may contribute to a better understanding of the pathogenetic mechanisms underlying biochemical disturbances in cervical cancer and provide a scientific basis for improving diagnostic and disease-monitoring approaches.

Keywords: cervical cancer, biochemical parameters, metabolism, oxidative stress, inflammation, laboratory diagnostics.

BACHADON BO'YNI SARATONI BILAN KASALLANGAN BEMORLARNING BIOKIMYOVIY KO'RSATKICHLARI

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✓ ***Rezyume***

Ushbu maqolada bachadon bo'yni saratoni bilan kasallangan bemorlarning biokimyoviy ko'rsatkichlarini o'rganishning ahamiyati yoritilgan. Biokimyoviy ko'rsatkichlarni tahlil qilish organizmdagi metabolik o'zgarishlarni, oksidlovchi stress va yallig'lanish jarayonlarini baholash, shuningdek, kasallikning klinik kechishi bilan bog'liq o'zgarishlarni aniqlashda muhim ahamiyatga ega. Olingan ma'lumotlar bachadon bo'yni saratonida biokimyoviy o'zgarishlarning patogenetik xususiyatlarini chuqurroq tushunish hamda diagnostika va monitoring yondashuvlarini takomillashtirish uchun ilmiy asos bo'lib xizmat qilishi mumkin.

Kalit so'zlar: bachadon bo'yni saratoni, biokimyoviy ko'rsatkichlar, metabolizm, oksidlovchi stress, yallig'lanish, laborator diagnostika.

БИОХИМИЧЕСКИЕ ХАРАКТЕРИСТИКИ ПАЦИЕНТОВ С РАКОМ ШЕЙКИ МАТКИ

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✓ ***Резюме***

В статье рассматривается значимость изучения биохимических показателей у пациенток с раком шейки матки. Анализ биохимических параметров имеет важное значение для оценки метаболических изменений в организме, процессов окислительного стресса и воспаления, а также выявления изменений, связанных с клиническим течением заболевания. Полученные данные могут способствовать более глубокому пониманию патогенетических особенностей биохимических нарушений при раке шейки матки и служить научной основой для совершенствования подходов к диагностике и мониторингу заболевания.

Ключевые слова: рак шейки матки, биохимические показатели, метаболизм, окислительный стресс, воспаление, лабораторная диагностика.

Relevance

Cervical cancer remains one of the most important malignancies affecting women worldwide and continues to represent a substantial public health burden, particularly in low- and middle-income countries. Persistent infection with high-risk human papillomavirus (HPV) is the principal etiological factor in cervical carcinogenesis, while the development and progression of the disease are influenced by genetic, metabolic, inflammatory, immune, and environmental factors [1–3]. Despite advances in HPV vaccination, screening, and therapeutic approaches, cervical cancer continues to cause considerable morbidity and mortality, emphasizing the need for improved understanding of the biological processes accompanying malignant progression.

Cancer development is increasingly recognized as a complex process involving not only genetic alterations but also profound metabolic and immunological reprogramming. Malignant cells undergo changes in energy production, redox homeostasis, lipid and amino-acid metabolism, and cellular signaling in order to support proliferation and adaptation to the tumor microenvironment. These alterations may also influence systemic biochemical parameters and contribute to heterogeneity in the clinical and metabolic profiles of patients with cancer.

The interaction between metabolic regulation, oxidative stress, inflammation, and intracellular signaling pathways is particularly relevant to tumor biology. Nuclear factor erythroid 2–related factor 2/antioxidant response element (Nrf2/ARE), nuclear factor-κB/mitogen-activated protein kinase (NF-κB/MAPK), and purinergic signaling pathways are involved in the regulation of oxidative stress, inflammation, cellular survival, and metabolic adaptation. Recent evidence has highlighted the potential of these interconnected pathways as important molecular targets in diseases characterized by oxidative and inflammatory dysregulation [4]. In particular, the review by Mamatova et al. described the molecular and translational pharmacology of *Melissa officinalis*, emphasizing interactions with Nrf2/ARE, NF-κB/MAPK, and purinergic receptors and demonstrating the broader relevance of these pathways to oxidative stress, inflammation, metabolism, and cancer-related processes [4].

The concept of immunometabolic regulation has also become increasingly important in oncology. Tumor-associated inflammation and metabolic alterations are closely interconnected, and systemic biochemical markers may reflect, at least in part, the biological consequences of tumor-associated metabolic and inflammatory changes. In a recent study of patients with glioblastoma, Mamatova et al. demonstrated relationships between circulating cytokines and biochemical parameters, including ALT, AST, bilirubin, iron, and LDH, supporting the concept that routine biochemical measurements can provide complementary information about the systemic immunometabolic state of patients with malignant disease [5].

The aim of the study is to study the biochemical characteristics of patients with cervical cancer.

Materials and methods

This immunometabolic perspective may also be relevant to the investigation of other solid tumors, including cervical cancer. Although biochemical parameters such as aminotransferases, bilirubin, calcium, magnesium, iron, creatinine, urea, lipids, phosphorus, and LDH are routinely measured in clinical practice, their combined distribution and variability in patients with cervical cancer have not been sufficiently characterized. Such parameters may be influenced by tumor-associated inflammation, nutritional status, tissue turnover, organ function, treatment effects, and concomitant

metabolic disturbances. Therefore, analysis of their distribution may provide useful descriptive information before more complex biomarker and prognostic investigations are undertaken.

The potential relevance of multitarget approaches to cancer biology has also recently been emphasized. Askarov and Mamatova reported that adjunctive natural multitarget therapy in patients with glioblastoma was associated with improved functional status and MRI stabilization, highlighting the potential importance of simultaneously influencing several biological processes involved in tumor progression, inflammation, metabolic dysregulation, and cellular signaling [6]. Although these findings were obtained in glioblastoma and cannot be directly extrapolated to cervical cancer, they further support the broader concept that malignant diseases should be investigated from integrated metabolic, inflammatory, and molecular perspectives.

Among routinely available biochemical markers, lactate dehydrogenase (LDH) is of particular interest because it reflects cellular metabolic activity and tissue turnover and has been investigated as a potential prognostic marker in several malignant diseases. Similarly, aminotransferases and bilirubin may provide information regarding hepatic and systemic metabolic status, whereas creatinine and urea can contribute to the assessment of renal-associated changes. Mineral parameters such as calcium, magnesium, and phosphorus, together with iron and lipid-related measurements, may additionally reflect nutritional, metabolic, inflammatory, or organ-related alterations. However, these markers are nonspecific and their interpretation in patients with cancer requires consideration of clinical stage, treatment status, comorbidities, and other potential confounding factors.

Despite increasing interest in cancer metabolism and immunometabolism, there remains a need for simple descriptive characterization of routine biochemical profiles in cervical cancer populations. Establishing the degree of interindividual variability in commonly measured biochemical parameters may help identify potentially relevant patterns and provide a foundation for subsequent investigations linking biochemical profiles with tumor stage, treatment response, prognosis, and survival.

Therefore, the present study aimed to characterize the biochemical profile of patients with cervical cancer by evaluating routinely measured hepatic, renal, mineral, lipid, iron-related, and metabolic parameters, including alanine aminotransferase (ALT), aspartate aminotransferase (AST), direct and total bilirubin, calcium, total cholesterol, magnesium, iron, creatinine, urea, triglycerides, lactate dehydrogenase (LDH), and phosphorus. Particular emphasis was placed on describing the distribution and interindividual variability of these parameters in a cohort of patients with cervical cancer.

Materials and Methods. A retrospective descriptive analysis was performed using biochemical laboratory data obtained from 23 patients diagnosed with cervical cancer (ICD-10: C53). The study dataset included measurements of alanine aminotransferase (ALT), aspartate aminotransferase (AST), direct and total bilirubin, calcium, total cholesterol, magnesium, iron, creatinine, urea, triglycerides, lactate dehydrogenase (LDH), and phosphorus.

For each biochemical parameter, descriptive statistics were calculated, including the mean, standard deviation (SD), median, interquartile range (IQR), and minimum–maximum values. The analysis was performed on the numerical values recorded in the original clinical laboratory dataset. Reference intervals were taken from the source table.

Results. The biochemical profile of the 23 patients with cervical cancer demonstrated considerable heterogeneity across several laboratory parameters. The mean ALT level was 19.61 ± 3.10, whereas AST showed greater variability, with a mean value of 25.13 ± 19.90. The median AST concentration was 31.0, with an observed range of 0–62.

Bilirubin concentrations demonstrated marked dispersion. The mean direct bilirubin level was 10.39 ± 18.05, while total bilirubin had a mean of 61.11 ± 96.22. The corresponding median values were 5.47 and 0, respectively. This substantial difference between mean and median values indicates considerable variability within the study cohort.

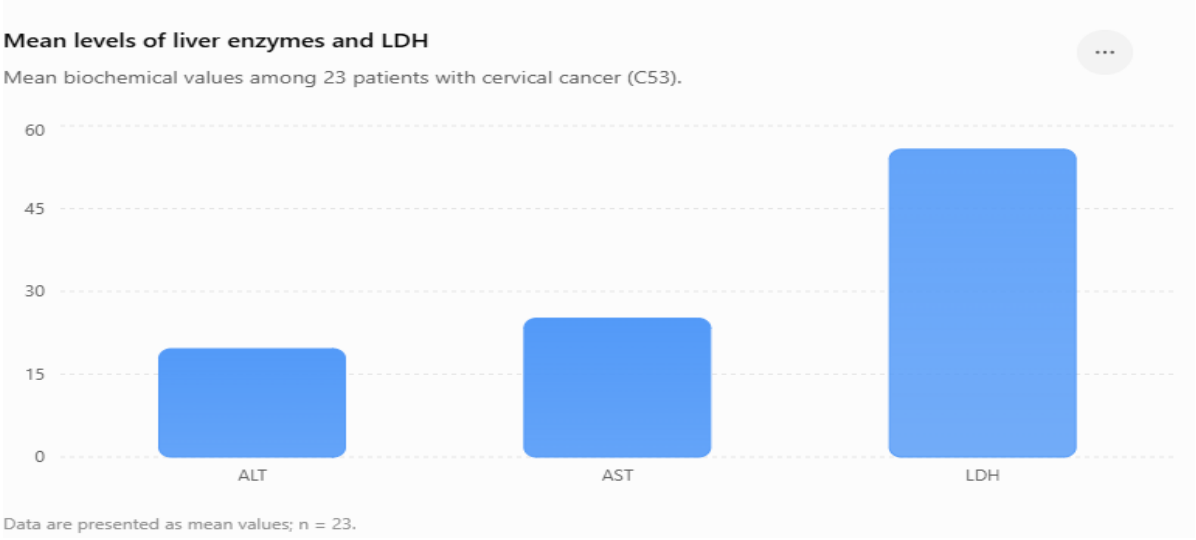


Figure 1 Liver enzymes and LDH

Results and discussions

The mean calcium concentration was 2.17 ± 0.80, while total cholesterol averaged 3.22 ± 1.05. Magnesium demonstrated pronounced variability, with a mean concentration of 1.48 ± 2.19 and values ranging from 0 to 8.08. Iron also showed substantial interindividual variation, with a mean value of 24.30 ± 32.91 and a range of 0–88.60.

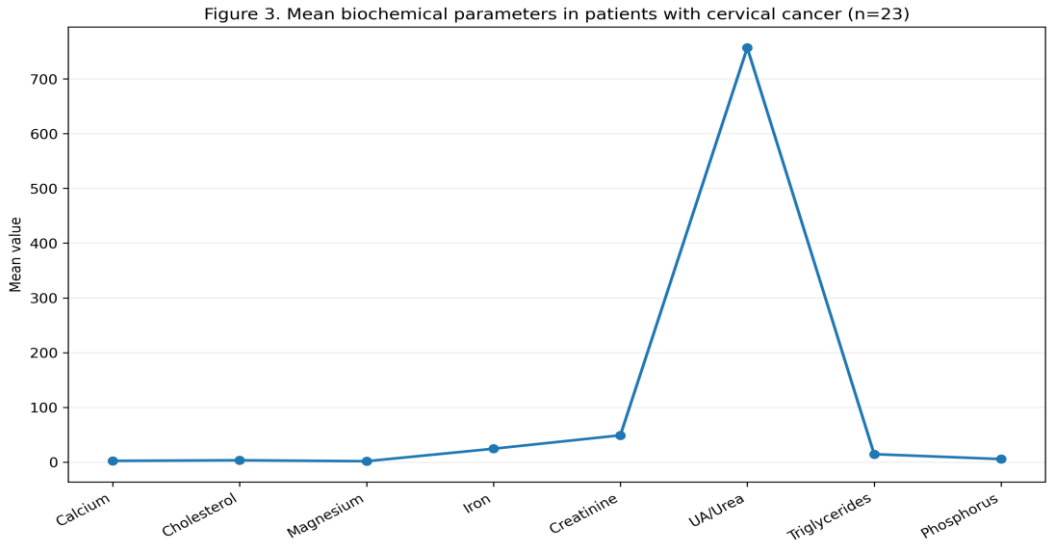


Figure 2 Minerals and metabolic parameters

Renal-associated biochemical parameters also demonstrated considerable variability. The mean creatinine concentration was 48.83 ± 40.32, with values ranging from 0 to 146.81. Urea demonstrated a mean value of 756.95 ± 506.66 and a range of 211.86–2100.98.

The mean triglyceride value was 14.35 ± 1.75. LDH demonstrated a mean concentration of 55.74 ± 40.39, with an observed range of 9–150. Phosphorus had a mean value of 5.41 ± 2.60 and a range of 0–8.55.

Overall, the biochemical profile of patients with cervical cancer was characterized by substantial variability in bilirubin, magnesium, iron, creatinine, urea, and LDH levels. These findings suggest marked biochemical heterogeneity among the examined patients. However, because the available dataset contains only a single patient cohort without a healthy control group, the present analysis demonstrates descriptive biochemical characteristics rather than establishing disease-specific associations or causal relationships.

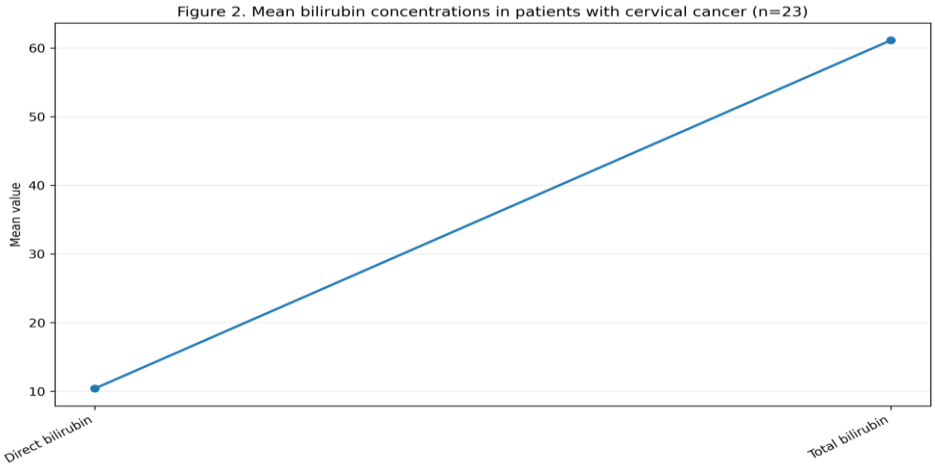


Figure 3 Bilirubin and renal-associated parameters

Discussion. The present retrospective descriptive analysis demonstrated substantial heterogeneity in the biochemical profile of patients with cervical cancer. The most pronounced variability was observed in bilirubin, magnesium, iron, creatinine, urea, and LDH concentrations, suggesting considerable interindividual differences in hepatic, renal, mineral, and metabolic status within the examined cohort.

Liver-associated parameters showed different patterns of variation. ALT remained relatively stable, with a mean concentration of 19.61 ± 3.10, whereas AST demonstrated substantially greater dispersion (25.13 ± 19.90). The greater variability of AST compared with ALT may reflect differences in systemic metabolic status, tissue injury, nutritional condition, or cancer-associated processes. LDH also showed marked heterogeneity, with values ranging from 9 to 150 and a mean of 55.74 ± 40.39. Because LDH is a nonspecific marker that may increase in response to tissue turnover and cellular injury, its variability may be relevant to the overall biological heterogeneity of patients with malignancy. However, interpretation of LDH in the present study should remain descriptive because clinical stage, tumor burden, treatment status, and other potential determinants were not available for comparative analysis.

Bilirubin demonstrated particularly pronounced dispersion. Direct bilirubin had a mean of 10.39 ± 18.05, while total bilirubin showed a mean of 61.11 ± 96.22. The difference between the mean and median values indicates a markedly skewed distribution, with a limited number of patients potentially accounting for disproportionately high values. Such variation may reflect differences in hepatic function, biliary metabolism, nutritional status, or concomitant clinical conditions. Nevertheless, without individual clinical information and a control group, these findings cannot be interpreted as evidence of a specific hepatic abnormality attributable to cervical cancer.

The mineral and metabolic parameters also demonstrated considerable interindividual variation. Calcium showed a mean concentration of 2.17 ± 0.80, while magnesium ranged from 0 to 8.08, with a mean of 1.48 ± 2.19. Iron concentrations similarly varied widely (24.30 ± 32.91; range 0–88.60). Such variability may reflect differences in nutritional status, systemic inflammation, anemia-related processes, renal function, or other clinical factors frequently encountered in oncology populations. However, the retrospective design and absence of information concerning supplementation, nutritional status, treatment history, and hematological parameters limit the ability to establish the underlying mechanisms.

Renal-associated biochemical parameters also exhibited marked variability. Creatinine ranged from 0 to 146.81, while urea demonstrated a broad distribution, with values ranging from 211.86 to 2100.98. These findings indicate substantial differences in renal-associated biochemical status among the patients. Nevertheless, the unexpectedly broad ranges and the presence of values close to zero for some parameters suggest that laboratory-unit conventions, missing-value coding, or data-entry characteristics should be carefully considered before clinical interpretation. Therefore, these parameters should preferably be validated against the original laboratory records in future analyses.

The descriptive nature of the present study is an important consideration when interpreting these findings. Since all 23 observations belonged to a single cervical cancer cohort and no healthy control

group was available, it is not possible to determine whether the observed biochemical characteristics differ significantly from those of the general population. Similarly, the study does not allow assessment of associations between biochemical parameters and tumor stage, histological subtype, treatment modality, prognosis, or survival. The observed heterogeneity should therefore be considered a description of biochemical variation within the studied cohort rather than evidence of disease-specific biochemical alterations.

Despite these limitations, the findings provide a useful preliminary characterization of biochemical variability in patients with cervical cancer. The results may serve as a basis for future studies incorporating larger cohorts, healthy controls, longitudinal measurements, and clinical variables such as FIGO stage, histological characteristics, treatment status, nutritional status, and hematological indices. Such approaches could help determine whether specific biochemical patterns have potential prognostic or clinical significance.

Conclusion

The present study demonstrated considerable biochemical heterogeneity among 23 patients with cervical cancer, particularly in bilirubin, magnesium, iron, creatinine, urea, and LDH concentrations. In contrast, ALT and total cholesterol showed comparatively less dispersion. The observed variability indicates that patients with cervical cancer may present with substantially different biochemical profiles involving hepatic, renal, mineral, and metabolic parameters.

However, because the study was retrospective, descriptive, based on a relatively small cohort, and lacked a healthy control group and detailed clinical stratification, the findings should not be interpreted as evidence of causal or disease-specific biochemical abnormalities. Further prospective studies with larger sample sizes, appropriate control groups, standardized laboratory measurements, and correlation with tumor stage, treatment, and clinical outcomes are warranted to determine the clinical and prognostic significance of these biochemical parameters.

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