



ONCOLOGICAL DISEASES AND DIAGNOSTIC METHODS

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Annotation: This article analyzes the most prevalent types of oncological diseases, the main contributing factors to their development, and the modern diagnostic technologies used to detect them. Early detection, particularly through screening methods, artificial intelligence, and liquid biopsy, plays a crucial role in improving patients' life expectancy and quality of life.

Keywords: Oncology, diagnostics, artificial intelligence, liquid biopsy, screening, cancer

Introduction

In the past decade, global trends related to cancer show that increased life expectancy, environmental pollution, unhealthy diets, smoking, and alcohol consumption significantly impact the development of cancer. Especially in low- and middle-income countries, cancer incidence is rising rapidly. According to UN forecasts, by 2040, cancer cases may reach 27.5 million globally.

Literature Review

Numerous international studies have shown that the earlier cancer is diagnosed, the higher the chance of effective treatment. Screening methods, such as mammography for breast cancer, colonoscopy for colorectal cancer, and Pap smears for cervical cancer, are widely recognized in developed countries. In addition, modern research highlights the importance of artificial intelligence, radiomics, and biomarkers in enhancing diagnostic accuracy. Studies by the World Health Organization and the American Cancer Society emphasize that countries with established screening programs have significantly reduced mortality rates. Scientific literature also points to the potential of genetic and molecular tests in the early detection and personalized treatment of cancer.

Methodology

This article is based on the analysis of scientific literature, WHO reports, and current clinical guidelines related to oncology. Information was obtained from reliable sources such as PubMed, Elsevier, and WHO databases. Data on commonly used laboratory tests and the effectiveness of early cancer detection methods were summarized. Additionally, the article presents general clinical approaches, including modern diagnostic techniques, screening strategies, and laboratory testing, aimed at improving early diagnosis and patient management.

Analysis and Results

Laboratory diagnostics play a central role in the early detection and monitoring of oncological diseases. Tumor markers such as CA-125, PSA, CEA, and AFP are used in clinical practice to detect specific types of cancer and evaluate treatment response. Molecular and genetic testing enables the identification of mutations (e.g., BRCA1/2, EGFR, KRAS) that guide targeted therapy decisions.

Advances in technologies like real-time PCR, next-generation sequencing (NGS), liquid biopsy, and mass spectrometry have significantly increased diagnostic accuracy. These methods allow non-invasive and early detection of malignancies with minimal risk to the patient.

Furthermore, immunological tests, including immunophenotyping and flow cytometry, are especially valuable in diagnosing hematological cancers. Bone marrow biopsies and cytogenetic studies provide comprehensive information about disease progression and prognosis.

Results from various studies show that integrating laboratory diagnostics into oncology care increases survival rates and improves overall treatment planning. Accurate and timely testing not only helps in confirming diagnosis but also assists in predicting disease recurrence and tailoring personalized treatment plans.

Conclusion and Recommendations

The fight against oncological diseases requires an integrated and evidence-based approach. Among the most critical components is the role of laboratory diagnostics, which allows for early detection, effective monitoring, and personalized treatment planning. The development of molecular-genetic and immunological testing has expanded diagnostic capabilities and increased accuracy.

To improve outcomes, it is necessary to:

- Expand access to laboratory testing and modern diagnostic tools, especially in remote regions;
- Train specialists in the latest laboratory techniques and interpretation methods;
- Implement national cancer screening programs based on evidence-based guidelines;
- Promote public awareness regarding the importance of regular check-ups and cancer prevention.

Through early diagnosis and a strong laboratory infrastructure, it is possible to significantly reduce cancer-related mortality and improve the quality of life for patients.

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