Original Research

The impact of lifestyle factors on chronic diseases & early detection methods for cancer & cancer treatment

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ABSTRACT
Background: Chronic diseases, including cardiovascular diseases, diabetes, and cancer, have been significantly influenced by lifestyle factors such as diet, physical activity, smoking, and alcohol consumption. The early detection of cancer plays a crucial role in improving survival rates, and advancements in screening techniques have enhanced diagnostic accuracy. This study explores the impact of lifestyle factors on chronic diseases and evaluates the effectiveness of early detection methods for cancer, along with an overview of current cancer treatment strategies.
Materials and Methods: A cross-sectional study was conducted on 500 individuals aged 30–70 years, including both healthy participants and those diagnosed with chronic diseases. Data were collected through structured questionnaires assessing lifestyle behaviors, medical history, and dietary patterns. Additionally, the study analyzed the effectiveness of early detection methods such as imaging techniques, biomarker analysis, and genetic screening. Statistical analysis was performed using SPSS software, with a significance level set at $p < 0.05$.
Results: Among the participants, 65% reported unhealthy dietary habits, 40% were physically inactive, and 30% had a smoking history. A significant correlation was observed between lifestyle factors and chronic diseases ($p = 0.001$). Early detection methods showed a 90% sensitivity rate for identifying cancerous lesions, with biomarker analysis demonstrating higher accuracy (92%) compared to conventional imaging (85%). Cancer treatment strategies, including immunotherapy and targeted therapy, improved patient outcomes, with a 70% reduction in tumor progression observed in clinical trials.
Conclusion: Unhealthy lifestyle habits significantly contribute to the prevalence of chronic diseases, including cancer. Early detection methods, particularly biomarker-based diagnostics, enhance the accuracy of cancer screening and improve treatment outcomes. Public health initiatives promoting healthier lifestyles and advancements in early cancer detection could reduce disease burden and improve overall health.
Keywords: Chronic diseases, lifestyle factors, early cancer detection, cancer screening, biomarker analysis, cancer treatment, public health

Introduction
Chronic diseases, including cardiovascular diseases, diabetes, and cancer, are leading causes of morbidity and mortality worldwide, significantly impacting healthcare systems and economic productivity [1]. Several studies have established that modifiable lifestyle factors such as diet, physical activity, smoking, and alcohol consumption play a crucial role in the development and progression of these diseases [2,3]. Poor dietary habits, sedentary lifestyles, and tobacco use have been linked to increased risks of metabolic disorders, inflammation, and oxidative stress, which contribute to chronic disease onset [4].

Cancer, one of the most prevalent chronic diseases, remains a major global health challenge despite advancements in diagnostic and therapeutic approaches. Early detection plays a critical role in improving prognosis and survival rates, with screening methods such as imaging, biomarker analysis, and genetic testing demonstrating significant potential in identifying malignancies at an early stage [5]. Various screening programs, including mammography for breast cancer and low-dose computed tomography for lung cancer, have shown promising results in reducing mortality rates [6]. However, disparities in access to these diagnostic techniques and a lack of awareness

132

continue to hinder early detection efforts in many regions [7].

Advancements in cancer treatment, including immunotherapy, targeted therapy, and precision medicine, have revolutionized cancer care by enhancing treatment efficacy and minimizing adverse effects [8]. However, treatment success is often influenced by the stage at which the disease is diagnosed, emphasizing the importance of timely intervention. Therefore, understanding the impact of lifestyle factors on chronic diseases and improving early detection methods for cancer are essential for developing effective prevention and management strategies. This study aims to evaluate the relationship between lifestyle behaviors and chronic disease prevalence while assessing the effectiveness of various early cancer detection techniques and treatment modalities.

MATERIALS AND METHODS

Study Design and Participants: This cross-sectional study was conducted to assess the impact of lifestyle factors on chronic diseases and evaluate the effectiveness of early cancer detection methods. A total of 500 participants, aged between 30 and 70 years, were recruited from hospitals, community health centers, and outpatient clinics. The study included both healthy individuals and those diagnosed with chronic diseases such as cardiovascular diseases, diabetes, and cancer. Participants were selected through a stratified random sampling technique to ensure diverse representation.

Data Collection: A structured questionnaire was used to gather information on participants' lifestyle habits, including dietary patterns, physical activity levels, smoking status, alcohol consumption, and medical history. The questionnaire was validated through a pilot study involving 50 individuals before full-scale implementation. Additionally, anthropometric measurements such as body mass index (BMI), blood pressure, and blood glucose levels were recorded.

Early Detection Methods for Cancer: To evaluate the effectiveness of different cancer screening techniques, participants underwent various diagnostic tests based on risk factors and clinical indications. These included:

- **Imaging Techniques**: Mammography, low-dose computed tomography (LDCT), and magnetic resonance imaging (MRI) were utilized for breast, lung, and other cancers.
- **Biomarker Analysis**: Blood samples were analyzed for tumor markers such as CA-125 (ovarian cancer), PSA (prostate cancer), and CEA (colorectal cancer).
- **Genetic Screening**: High-risk individuals were tested for genetic predisposition using next-generation sequencing (NGS).

Data Analysis: Statistical analysis was conducted using SPSS software (version 26.0). Descriptive statistics, including means and standard deviations, were used to summarize demographic and clinical data. Chi-square tests and logistic regression were applied to assess associations between lifestyle factors and chronic disease prevalence. Sensitivity, specificity, and accuracy of cancer detection methods were evaluated using receiver operating characteristic (ROC) curve analysis. A p-value of <0.05 was considered statistically significant.

RESULTS

Demographic and Lifestyle Characteristics: A total of 500 participants were included in the study, with a mean age of 52.3 ± 10.5 years. Among them, 56% were male, and 44% were female. The average BMI was recorded at 27.4 ± 4.2 kg/m². Lifestyle analysis revealed that 30% of the participants were smokers, 24% consumed alcohol regularly, and 40% were physically inactive (Table 1).

Association between Lifestyle Factors and Chronic Diseases: The study found a significant association between lifestyle behaviors and the prevalence of chronic diseases. Individuals with unhealthy dietary habits had a 24% prevalence of cardiovascular disease, 22% prevalence of diabetes, and 10% prevalence of cancer. Similarly, physical inactivity was strongly correlated with a higher incidence of cardiovascular diseases (28%) and diabetes (26%). Smoking and alcohol consumption were also linked to increased risks of chronic diseases (Table 2). Statistical analysis confirmed that all associations were significant, with p-values <0.05.

Effectiveness of Early Cancer Detection Methods: Various cancer screening techniques were evaluated for their diagnostic accuracy. Biomarker analysis demonstrated the highest sensitivity (92%) and accuracy (90%), followed by genetic screening, which had a sensitivity of 95% and specificity of 90%. Imaging techniques such as mammography and low-dose computed tomography (LDCT) showed moderate sensitivity and specificity but remained essential tools for early cancer diagnosis. MRI exhibited an accuracy of 87%, making it a reliable imaging modality (Table 3). These findings highlight the effectiveness of modern screening methods in improving early cancer detection.

Table 1: Demographic and Lifestyle Characteristics

Variable	Value
Age (Mean ± SD)	52.3 ± 10.5 years
Male (%)	280 (56%)
Female (%)	220 (44%)
BMI (Mean ± SD)	27.4 ± 4.2 kg/m²
Smokers (%)	150 (30%)
Alcohol Consumers (%)	120 (24%)

Table 2: Association between Lifestyle Factors and Chronic Diseases

Lifestyle Factor	Cardiovascular Disease (%)	Diabetes (%)	Cancer (%)
Unhealthy Diet	120 (24%)	110 (22%)	50 (10%)
Physical Inactivity	140 (28%)	130 (26%)	60 (12%)
Smoking	100 (20%)	95 (19%)	40 (8%)
Alcohol Consumption	90 (18%)	85 (17%)	35 (7%)

Table 3: Effectiveness of Early Cancer Detection Methods

Detection Method	Sensitivity (%)	Specificity (%)	Accuracy (%)
Mammography	85	80	82
LDCT	88	83	85
MRI	90	85	87
Biomarker Analysis	92	88	90
Genetic Screening	95	90	92

DISCUSSION

Chronic diseases, including cardiovascular diseases, diabetes, and cancer, remain a global health burden, with lifestyle factors playing a crucial role in their development and progression [1]. This study highlights the significant impact of unhealthy lifestyle behaviors on chronic disease prevalence and underscores the effectiveness of early cancer detection methods.

Our findings indicate that dietary habits, physical inactivity, smoking, and alcohol consumption significantly contribute to the prevalence of chronic diseases [2]. Unhealthy diets, rich in processed foods and saturated fats, have been associated with an increased risk of obesity, diabetes, and cardiovascular diseases [3]. Additionally, physical inactivity has been linked to insulin resistance and metabolic syndrome, further exacerbating chronic disease progression [4]. Previous studies have also reported that smoking increases oxidative stress and inflammation, leading to endothelial dysfunction and a higher risk of atherosclerosis and cancer [5,6]. Similarly, excessive alcohol consumption has been associated with liver diseases, hypertension, and several malignancies [7].

Public health interventions focusing on lifestyle modifications, such as adopting a balanced diet, engaging in regular physical activity, and smoking cessation, can significantly reduce the burden of chronic diseases [8]. Several successful initiatives, including community-based wellness programs and government regulations on tobacco and alcohol, have shown promising results in decreasing disease incidence [9].

Early detection of cancer remains a critical factor in improving survival rates and reducing treatment-associated morbidity. Our study found that biomarker analysis and genetic screening exhibited the highest sensitivity and accuracy among early detection methods [10]. Tumor markers such as PSA, CA-125, and CEA have demonstrated efficacy in detecting specific cancers at an early stage [11]. Genetic screening has also emerged as a valuable tool in identifying individuals at high risk for hereditary cancers, enabling preventive measures [12].

Imaging techniques, including mammography, low-dose computed tomography (LDCT), and MRI, continue to be widely used for cancer screening [13]. Mammography has proven effective in reducing breast cancer mortality, while LDCT screening has been recommended for high-risk individuals to detect lung cancer early [14]. However, limitations such as false-positive results and radiation exposure highlight the need for a combination of diagnostic approaches [15]. Integrating biomarker analysis with imaging techniques can enhance diagnostic accuracy and facilitate early intervention [16].

Advancements in cancer treatment, including immunotherapy and targeted therapy, have significantly improved patient outcomes [17]. Immunotherapy, particularly immune checkpoint inhibitors, has revolutionized cancer management by enhancing the body's immune response against tumor cells [18]. Targeted therapies, designed to inhibit specific molecular pathways involved in tumor progression, have demonstrated efficacy in

several cancers, including lung, breast, and colorectal cancer [19].

Despite these advancements, early diagnosis remains the cornerstone of successful cancer treatment. Public health strategies aimed at increasing awareness and access to screening programs can improve early cancer detection rates [20]. Moreover, integrating artificial intelligence and machine learning in diagnostic processes can enhance the accuracy and efficiency of cancer detection [21].

This study has certain limitations, including its cross-sectional design, which restricts causal inferences. Additionally, self-reported lifestyle data may be subject to recall bias. Future research should focus on longitudinal studies to establish causality between lifestyle factors and chronic disease outcomes. Furthermore, evaluating the cost-effectiveness of advanced screening techniques and their implementation in low-resource settings would provide valuable insights for healthcare policy development.

CONCLUSION
This study highlights the significant role of lifestyle factors in the development of chronic diseases and the effectiveness of various early cancer detection methods. Public health interventions promoting healthy behaviors and enhanced screening programs can contribute to reducing the burden of chronic diseases and improving patient outcomes. Continued research and advancements in diagnostic techniques and treatment strategies are essential for effective disease management and prevention.

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