Clinical Correlation of Questionnaire-Based Lung Cancer Risk Factors with Low-Dose CT Findings in an Indian Screening Cohort

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Background:

Early detection of lung cancer significantly improves patient outcomes, yet existing screening strategies are often limited by low participation and lack of targeted outreach. This study evaluates a layered approach incorporating an AI-based risk stratification tool, low-dose computed tomography (LDCT), and liquid biopsy (ctDNA) for identifying and monitoring early lung malignancies in high-risk populations.

Methodology:

An AI-driven questionnaire incorporating clinical, behavioural, and environmental risk factors was administered to 1,000 individuals. All participants categorized as high risk underwent LDCT screening. Those with radiological abnormalities (n=200) were further evaluated using plasma-based ctDNA analysis. Key mutations and methylation markers were assessed via targeted sequencing. Individuals with positive ctDNA findings (n=50) were advised structured follow-up with imaging at 3 and 12 months. Invasive diagnostic procedures were reserved for cases with progressive or persistent findings.

Results:

Among the 1,000 high-risk individuals screened, 200 (20%) exhibited suspicious nodules on LDCT. Liquid biopsy performed on this subset revealed ctDNA positivity in 50 individuals

(25%). These patients were enrolled in longitudinal follow-up, with ongoing monitoring to evaluate disease progression and refine the predictive accuracy of combined radiologic and molecular assessment. Histologic confirmation is currently pending based on follow-up scans and clinical evolution.

Conclusion:

This interim analysis supports the feasibility of integrating AI-based risk assessment with imaging and liquid biopsy to enable early surveillance in lung cancer. The ctDNA assay added a valuable layer of specificity in triaging individuals for follow-up, potentially reducing unnecessary invasive procedures. This structured, non-invasive approach may enhance early detection efforts and provide a scalable model for population-level lung cancer screening programs.