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Retrospective Analysis Of Lung Cancer Screening In Patients Diagnosed With Lung Cancer In NGHA Riyadh SA

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Abstract

Background: Worldwide, lung cancer continues to be a significant cause of cancer- related deaths; delayed diagnosis greatly aggravates subpar outcomes. Although data favors low-dose CT screening for high-risk groups, the use of lung cancer screening initiatives in Saudi Arabia is not well recorded. The goal of this research was to evaluate the lung cancer screening frequency, patient features, comorbidities, staging at diagnosis, and therapeutic outcomes at the National Guard Health Affairs (NGHA), Riyadh, Saudi Arabia.

Methodology: A retrospective cross-sectional study was conducted including all patients diagnosed with lung cancer at NGHA Riyadh from January 2020 to December 2023. Using a structured data extraction form encompassing demographics, smoking history, comorbidities, screening status, cancer staging, histology, therapy, and outcomes. Data were gathered from an electronic medical records review.

Statistical analyses descriptive and comparative, including chi-square tests and logistic regression, were carried out with SPSS.

Results: The study covered 164 patients, predominantly male (72.6%) and Saudi citizens (94.4%), with an average age of 65.9 years. Almost half (43.3%) were never smokers. Hypertension (40.8%) and diabetes mellitus (43.9%) were among the most prevalent comorbidities. Only 15.9% of those patients were examined for lung cancer, with low-dose CT accounting for 45% of the examinations. The majority of patients, 57.9%, were diagnosed with advanced-stage disease (stage 4). Adenocarcinoma was the most prevalent histological kind (50%). The primary treatment modality was chemotherapy (46.3%). Screening was not significantly linked with age, staging, or survival outcomes. High rates of disease progression (48.2%) and steady disease (40.9%) were noted.

Conclusion: Among individuals at NGHA Riyadh, the results show significant underuse of lung cancer screening and a heavy burden of advanced-stage diagnoses. Enhanced screening programs—particularly low-dose CT targeted at high-risk groups—are necessary to allow earlier detection and so improve clinical outcomes. Improving lung cancer screening awareness and healthcare infrastructure in Saudi

Arabia could favorably affect mortality rates.

Keywords: Lung cancer, screening, retrospective analysis, NGHA Riyadh, Saudi Arabia, patient diagnosis, healthcare evaluation.

Introduction

Lung cancer remains a significant global health concern, with high prevalence rates and considerable mortality [1,2]. Worldwide, lung cancer is the leading cause of cancer-related deaths, primarily due to its late-stage diagnosis. An analysis by economic development level reveals that while cancer mortality rates among men do not show significant differences, there is a notable disparity in lung cancer deaths among women between industrialized and developing countries. In industrialized nations, women experience a higher rate of lung cancer deaths compared to their counterparts in developing nations [3]. Conversely, in developing countries, lung cancer deaths are still overshadowed by those caused by breast cancer among females [3]. The relationship between lung cancer incidence and mortality is closely associated with cigarette smoking trends. As smoking rates increase—typically beginning with men and subsequently rising among women—lung cancer incidence and mortality follow suit [4-6]. This trend often continues until comprehensive tobacco control measures are implemented, leading to a subsequent decline in both incidence and mortality rates [4-6]. According to GLOBOCAN 2020, lung cancer accounted for approximately 2.2 million new cases (11.4% of total cancer cases) and nearly 1.8 million deaths (18.0% of total cancer deaths) worldwide in 2020 [7].

In Saudi Arabia, the situation showed some similarity with this global trend, with lung cancer ranking among the top cancers affecting the population [8]. Lung cancer ranks third among men and 12th among females [9].The increasing incidence underscores the critical need for effective screening strategies to identify the disease at an earlier, more treatable stage.

Screening guidelines for lung cancer are established by various health organizations to optimize early detection and improve outcomes. The U.S. Preventive Services Task Force (USPSTF) recommends annual screening with low-dose computed tomography (LDCT) for individuals at high risk, typically defined as those aged 50 to 80 years with a significant smoking history [10]. In Saudi Arabia, local guidelines align with these recommendations, emphasizing the importance of early detection, although adherence and implementation can vary [11].

Despite these guidelines, screening rates both globally and within Saudi Arabia remain suboptimal. Internationally, adherence to screening recommendations is inconsistent, often influenced by factors such as healthcare access, awareness, and socioeconomic status [12]. In Saudi Arabia, while there is a growing recognition of the need for screening, actual uptake and implementation of these practices have been limited, influenced by barriers such as lack of public awareness, logistical challenges, and healthcare system constraints.

Evaluating lung cancer screening practices is crucial to improving outcomes and addressing gaps in current approaches. Understanding how screening is conducted and identifying the barriers to effective implementation can lead to more targeted interventions and policies. This evaluation becomes even more pertinent in Saudi Arabia, where there is a noticeable lack of comprehensive studies assessing the effectiveness and challenges of screening practices.

Methodology

At the National Guard Health Affairs (NGHA) in Riyadh, Saudi Arabia, a prominent healthcare institution known for providing specialized oncology and respiratory treatment to a varied patient base, the study was carried out. With its thorough diagnostic and treatment capabilities as well as access to large electronic medical records, the NGHA Riyadh offered a pertinent and resource-rich environment. Under this setting, a thorough study of screening-related outcomes as well as clinical methods was made possible, therefore enabling a strong evaluation of lung cancer screening techniques.

To guarantee a representative and relevant sample, study participants were chosen based on specific inclusion and exclusion criteria. The study population excluded patients diagnosed before January 1, 2020, those with inaccessible or incomplete medical records, and those who received all their treatment only outside NGHA Riyadh without documented screening histories. The study included patients who

were 18 years old and above diagnosed with lung cancer at NGHA Riyadh between January 1, 2020, and December 31, 2023, and for whom comprehensive medical records, including screening histories and pertinent diagnostic data, were available. Using historical data, a cross-sectional retrospective study design offered the capacity to investigate the incidence and prominent characteristics of lung cancer screening at a single point in time. This method helped to analyze existing screening rates, pinpoint risk factors, and assess diagnostic staging as well as to explore obstacles that could obstruct efficient screening inside the institution.

With the goal of including all qualifying cases to maximize the study's validity, the sample size was fixed by the overall number of qualified lung cancer cases recorded at NGHA Riyadh throughout the specified period. To guarantee statistical power and enable thorough analysis of trends, links, and possibly missed screening practices, a minimum target of 100 cases was set.

A non-random convenience sampling technique was adopted to get the target population. All patients diagnosed at NGHA within the research window meeting the established inclusion criteria were entered. The approach was selected because the specificity and rather restricted scope of the NGHA population made other sampling methods less practicable for the goals of the study.

Data collection depended on regular analysis of patient charts and electronic medical records to guarantee complete retrieval of pertinent clinical data. Key characteristics like screening type and timing, adherence to guideline-recommended practices, lung cancer stage at diagnosis, histologic results, and therapies received were consistently documented using a structured data extraction form. Additional information on patient risk factors (including smoking and family history, as well as occupational exposures) and recording of any impediments or screening delays was collected. To guarantee clarity and completeness, pilot testing of the data extraction tool was done on a limited number of charts using input from clinical professionals to improve the device. Having several researchers extract data independently from a random sample and then compare their responses guaranteed consistency, therefore establishing inter-rater reliability. Standard definitions were used all around: screening involved the deliberate detection of asymptomatic, high-risk people utilizing approved tests such as low-dose CT; staging followed the TNM system to categorize disease extent.

Following data collection, all patient information was entered into a secure, anonymized database. Data cleaning procedures were performed to confirm correctness and completeness, with all identifiers deleted to uphold confidentiality in line with ethical standards. Descriptive statistics, including frequencies and percentages, were used to describe the population's traits, screening rates, and staging information for the analysis. Comparative analyses using chi-square or Fishers exact tests looked at correlations between screening adherence and characteristics such as demographics or risk history. Logistic regression models were constructed to examine predictors of undergoing screening and obstacles encountered. All statistical analysis was carried out with SPSS or comparable statistical software package; findings were interpreted inside the scope of the study aims and acknowledged limitations.

Results

The study included 164 patients with lung cancer, whose mean age was 65.9 years (SD = 11.1). The majority of patients were male, comprising 72.6% (n=119) of the sample, while females made up 27.4% (n=45). Most participants were Saudi nationals, accounting for 94.4% (n=152). Regarding smoking history, almost half of the patients (43.3%, n=71) reported never having smoked. Former smokers constituted 26.2% (n=43) and current smokers were 28.7% (n=47) (Table 1).

Table 1: Demographic factors of the patients

		Count	Column N %
Age	Mean (SD)	65.9 (11.1)	
Gender	Male	119	72.6%
	Female	45	27.4%

Nationality	Saudi	152	94.4%
	Non-Saudi	9	5.6%
Smoking History	NA	3	1.8%
	Never smoked	71	43.3%
	Former smoker	43	26.2%
	Current smoker	47	28.7%

The prevalence of comorbidities among patients showed that 16.6% (n=26) had no recorded comorbid conditions. Diabetes mellitus (DM) was the most common comorbidity, affecting 43.9% (n=69) of patients, followed by hypertension (HTN) at 40.8% (n=64), and dyslipidemia (DLP) in 19.7% (n=31). Chronic obstructive pulmonary disease (COPD) was present in 7.6% (n=12), bronchial asthma (BA) in 8.9% (n=14), and diabetic sensory neuropathy (DSL) in 11.5% (n=18) (Figure 1).

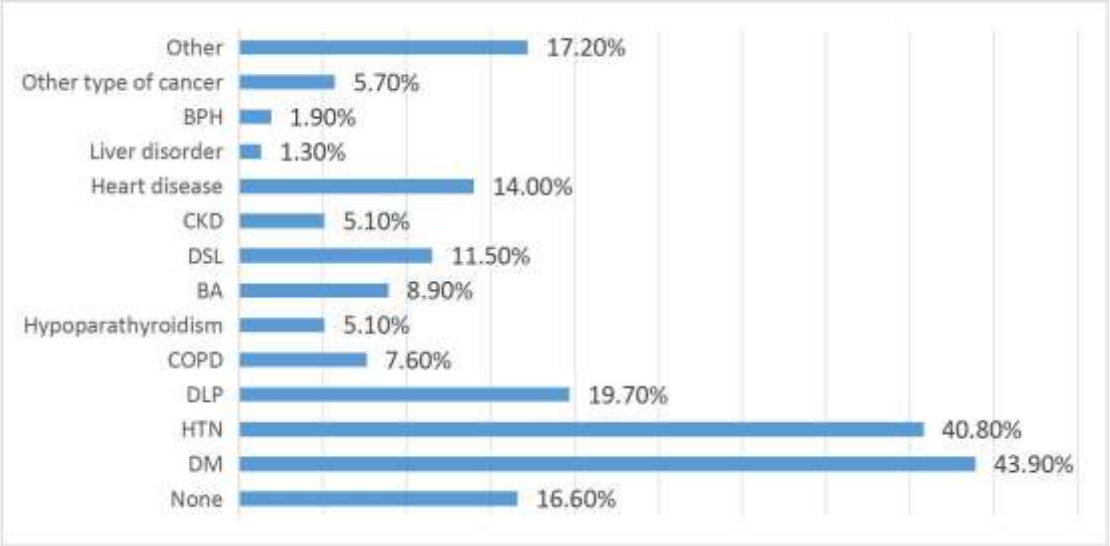
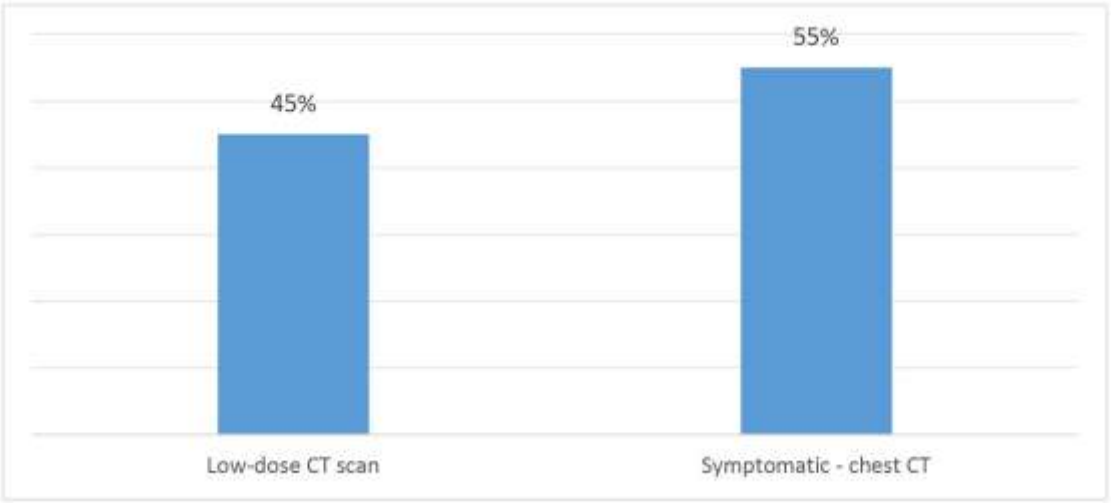


Figure 1: Prevalence of different comorbidities among the patients

Lung cancer screening was infrequently reported, with 84.1% (n=138) of patients not having received any screening, while only 15.9% (n=26) underwent screening (Figure

2). Among those examined, different modalities were used: 45.0% (n=9) had low- dose computed tomography (CT) scans specifically for screening, while 55.0% (n=11) underwent symptomatic chest CT scans (Figure 3). Screening adherence to guidelines was mixed; 14.0% (n=23) met established screening guidelines, 37.2% (n=61) did not meet guidelines, and adherence was unknown for 48.8% (n=80) (Figure 4).

Figure 2: Prevalence of lung cancer screening



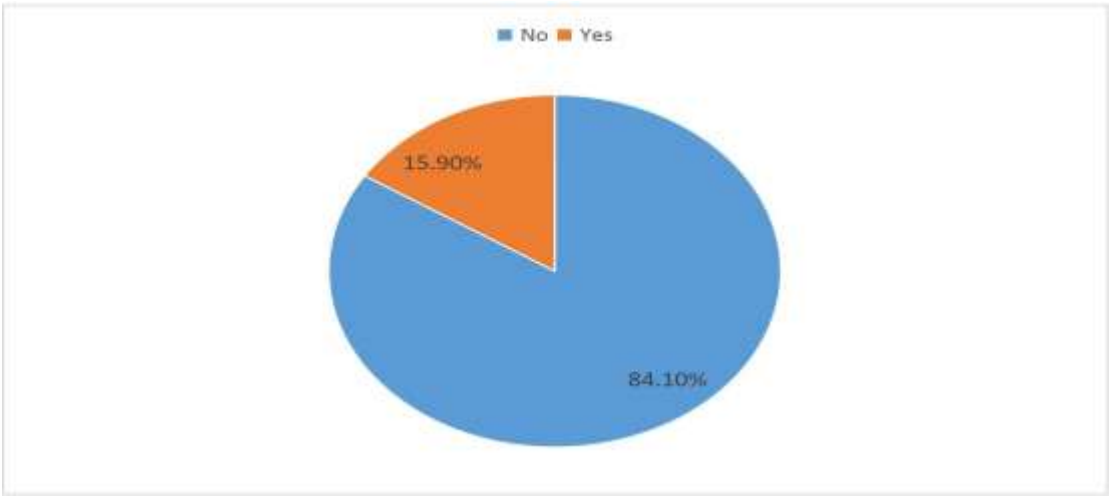


Figure 3: Type of screening

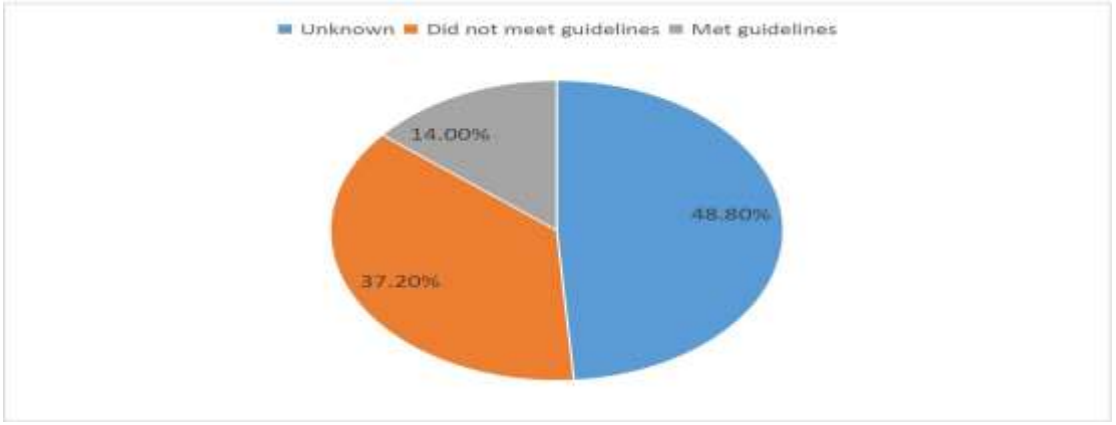


Figure 4: Prevalence of Screening Adherence

At diagnosis, staging was not available for 16.5% (n=27) of patients. Among those with staging data, the majority were diagnosed at advanced stages: stage 4 accounted for 57.9% (n=95), stage 3 for 14.0% (n=23), stage 1 for 7.9% (n=13), and stage 2 for 3.7% (n=6). The predominant histological subtype was adenocarcinoma (50.0%, n=66), followed by non-small cell lung cancer (NSCLC) at 22.7% (n=30), carcinoma (10.6%, n=14), and small cell lung cancer (5.3%, n=7). Treatment varied, with chemotherapy

being the most common (46.3%, n=76), followed by combinations such as both surgery and chemotherapy (9.1%, n=15), and chemotherapy with radiation therapy (18.9%, n=31). Family history of lung cancer was rare (0.6%, n=1), though not available for 54.9% (n=90). Treatment outcomes showed that 7.9% (n=13) achieved remission, 40.9% (n=67) had stable disease, and 48.2% (n=79) experienced disease progression. Survival data indicated that 75.6% (n=124) of patients were alive at the time of data collection and 21.3% (n=35) were deceased (Table 2).

Table 2: Characteristics and outcomes of lung cancer

		Count	Column N %
Staging at Diagnosis:	NA	27	16.5%
	Stage 1	13	7.9%
	Stage 2	6	3.7%
	Stage 3	23	14.0%
	Stage 4	95	57.9%
Histology:	NSCLS	30	22.7%
	Adenocarcinoma	66	50.0%
	Carcinoma	14	10.6%
	T3N	4	3.0%
	Small cell lung cancer	7	5.3%
	Other	11	8.3%
Treatment Received:	Chemotherapy	76	46.3%
	Surgery	15	9.1%
	Both surgery and chemotherapy	15	9.1%
	Radiation therapy	7	4.3%
	Chemotherapy and radiation	31	18.9%
	All of them	8	4.9%
	Palliative care	2	1.2%
	Refuse or not fit treatment/ Not determined yet	10	6.1%
Family History of Lung Cancer	No	73	44.5%
	Yes	1	0.6%
	NA	90	54.9%
Outcome of Treatment:	NA	5	3.0%
	Remission	13	7.9%
	Stable disease	67	40.9%
	Progressed	79	48.2%
Survival Status:	NA	5	3.0%
	Deceased	35	21.3%
	Alive	124	75.6%

Analysis of screening prevalence found no statistically significant association with gender (p=0.307), although a higher percentage of males (17.6%) underwent screening compared to females (11.1%). Nationality also showed no significant relationship with screening receipt (p=0.175), with all screened patients being Saudi nationals. Smoking history did not significantly increase screening status (p=0.213), though former smokers had the highest screening rate (25.6%) relative to never smokers (12.7%) and current smokers (12.8%). Stage at diagnosis was not significantly associated with screening status (p=0.338), although screening was more common among early-stage patients (stage 1: 30.8%, stage 2: 33.3%) compared to later stages. Treatment outcome showed a trend but did not reach statistical significance (p=0.084); remission cases had higher screening rates (30.8%) compared to stable disease (9%) and progressed disease (20.3%). Survival status was also not significantly related to screening receipt (p=0.492), with similar screening proportions among alive (15.3%) and deceased (20.0%) patients (Table 3).

ion between prevalence of receiving lung cancer screening and demographic factors and cancer outcomes

		Screening Received:				
		No		Yes		
		Count	Row N %	Count	Row N %	P-value
Gender	Male	98	82.4%	21	17.6%	0.307
	Female	40	88.9%	5	11.1%	
Nationality	Saudi	126	82.9%	26	17.1%	0.175
	Non-Saudi	9	100.0%	0	0.0%	
Smoking History	NA	3	100.0%	0	0.0%	0.213
	Never smoked	62	87.3%	9	12.7%	
	Former smoker	32	74.4%	11	25.6%	
	Current smoker	41	87.2%	6	12.8%	
Staging at Diagnosis:	NA	23	85.2%	4	14.8%	0.338
	Stage 1	9	69.2%	4	30.8%	
	Stage 2	4	66.7%	2	33.3%	
	Stage 3	21	91.3%	2	8.7%	
	Stage 4	81	85.3%	14	14.7%	
Outcome of Treatment:	NA	5	100.0%	0	0.0%	0.084
	Remission	9	69.2%	4	30.8%	
	Stable disease	61	91.0%	6	9.0%	
	Progressed	63	79.7%	16	20.3%	
Survival Status:	NA	5	100.0%	0	0.0%	0.492
	Deceased	28	80.0%	7	20.0%	
	Alive	105	84.7%	19	15.3%	

Discussion

This study offers a thorough analysis of lung cancer patient demographics, screening techniques, disease characteristics, comorbidities, and treatment outcomes in a sizable tertiary care institution in Riyadh, Saudi Arabia. The results strongly correspond with published literature and emphasize several significant patterns in lung cancer epidemiology and clinical care. With a mean age of about 66 years, the study population was predominantly male (72.6%), which is consistent with global and regional data that show lung cancer is more common among older adults and males, frequently attributed to higher rates of tobacco usage among men in many communities [13–15]. Though the disease epidemiology in non-Saudi populations could warrant more study in future multicenter studies, the great majority of patients were Saudi nationals, reflecting the hospitals catchment.

Notably, almost half of the patients reported never smoking, which is in line with recent studies suggesting a rising incidence of lung cancer among non-smokers, particularly in Middle Eastern and Asian populations [16,17]. Confirming the well- known role of smoking as the leading risk factor for lung cancer development [18,19], former and current smokers made up more than half of the cases.

Prevalent comorbid conditions like diabetes mellitus (43.9%) and hypertension (40.8%) matched the high burden of these diseases in the overall Saudi population [20]. Several studies have emphasized how common comorbid conditions like diabetes and cardiac disorders are in cancer patients and how they may complicate therapy decisions and results [21].

Reviewing screening methods, the data show a painfully low rate of lung cancer screening: just 15.9% of patients had undergone any sort of screening, of which little under half had a low-dose CT, the gold standard for lung cancer screening according to worldwide guidelines. This low screening prevalence is comparable to that found in a few research and varied contexts [22,23]. These parallels reported obstacles to screening in the literature, namely lack of awareness, limited access to screening programs, and inadequate guideline implementation in many non-Western environments [24,25]. Additionally, less than 15% of screened patients fulfilled accepted screening criteria, indicating possible deficiencies in both referral and adherence—which have been observed in other healthcare settings. These results emphasize how quickly more outreach, education, and infrastructure are needed to help lung cancer screening in high-risk groups.

With 57.9% of cases diagnosed at stage 4, the appearance of the illness was frequently late, in line with regional and worldwide evidence showing most lung cancer patients present with advanced disease caused by the absence of worrying symptoms at early stages and lack of systematic screening [26]. Consistent with worldwide changes in lung cancer histology seen in recent decades—possibly linked to altered smoking patterns and more exposure to other risk factors including air pollution [1]—adenocarcinoma was the most frequent histological type detected.

Treatment patterns were inconsistent; chemotherapy was the most often used therapy, which fits the high prevalence of advanced-stage illness restricting surgical options [27]. Only a minority got surgery or multimodal treatment; this is consistent with published information showing that resectable cases make up a small portion of whole lung cancer diagnoses owing to late presentation [28]. Outcomes data revealed that fewer than 10% achieved remission, and disease progression was common—this reinforces the urgent necessity for earlier detection and improved therapeutic approaches [28].

Though there was a non-significant trend toward higher screening rates among former smokers and those diagnosed at earlier stages, no major associations were noted between receiving screening and demographic characteristics including gender, nationality, or smoking history. Furthermore, screening did not show statistically significant relationships with survival outcomes in this study, likely reflecting both the small number of screened cases and the overall predominance of late-stage presentations, a limitation highlighted in the literature as a challenge to demonstrating the impact of screenings in real-world cohorts unless implemented broadly. This pattern has been observed in other settings as well and may reflect both increased health-seeking behavior post-smoking cessation and improved detection in populations with prior risk modification [29].

Conclusion

In summary, these results echo the existing literature on both the challenges and opportunities in lung cancer control: the burden of late-stage disease, underutilization of screening, and the critical importance of tailored public health and health system interventions to improve early detection and outcomes. Expansion of low-dose CT screening, especially for high-risk groups, enhanced awareness

campaigns, and strengthened primary care engagement could significantly advance lung cancer outcomes in similar populations. Future studies should focus on longitudinal tracking of screening interventions and the integration of molecular and genetic data to refine risk stratification and prevention strategies.

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