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EGFR Mutations, ROS1 and ALK Rearrangements, Smoking and Gender Association in Non-Small Cell Lung Cancer Patients at a Tertiary Care Centre in South India

Dr. Lingeshwaran S[1], Dr P N Rajasekaran[2], Dr Jebasingh[3]

[1]Senior Resident, Department of Medical Oncology, Govt Rajaji Hospital Madurai, India

[2]Professor & HOD, Department of Medical Oncology, Govt Rajaji Hospital Madurai, India

[3]Associate Professor, Department of Medical Oncology, Govt Rajaji Hospital Madurai, India

Abstract: ***Background: Driver mutations show up in about 80% lung adenocarcinomas. They play big role in treatment choices & how well patients do. Aim: This study looks at how often we see mutations in the epidermal growth factor receptor (EGFR), well as ALK & ROS1 changes. We also checked how these relate to age & gender in non - small cell lung cancer. Plus, we wanted to see how smoking affects EGFR mutations. This info comes from a medical center in South India. Methods: We included everyone aged 20 - 80 who was diagnosed with lung cancer & treated at Government Rajaji Hospital in Alwarpuram, Madurai, Tamil Nadu, between June 2023 and September 2024. This was a descriptive and cross - sectional study based on past records. Results: From the 90 patients with confirmed lung cancer, 61 (67.77%) were men & 29 (32.22%) were women. A total of 74 patients (82.22%) had adenocarcinoma, while 16 patients (17.77%) had squamous cell carcinoma. Among the study group, 23 patients (25.5%) had detected EGFR mutations, 3 (3.33%) had ALK mutations, & only 1 patient (1.11%) had a ROS1 mutation. Also, one patient each had positive results for ALK & ROS1 mutations (2.32%). In those with EGFR mutations, 15 patients (65.21%) were men, and 8 (34.78%) were women. Notably, only a small number of smokers had EGFR mutations—30.43% (7 patients) compared to 69.5% (16 patients) who didn't smoke. Conclusion: This study gives us important insights into lung cancer patterns among people in Tamil Nadu.***

Keywords: Lung cancer, EGFR mutations, ALK mutations, smoking, Tamil Nadu

1. Introduction

Lung cancer is a leading cause of death related to cancer all around the world. Cigarette smoking is still a big risk factor here. It also impacts the types of lung cancer seen & how patients respond to treatment. EGFR mutations are common genetic changes found in lung cancer cases. Treatments like EGFR - tyrosine kinase inhibitors (TKIs) can really help improve life quality for these patients and are now key therapies for those with EGFR - mutant non - small cell lung cancer.

Mutations vary by place—like from 20% to76% in Asia Pacific regions, but only about 6% to41% in Europe and even lower in North America at around 3% to 42%. In India, we see about 31% to 51.8% rate for EGFR mutations while there's just about 2.7% to3% for ALK changes and approximately 2% to2.8% for ROS1 rearrangements.

Earlier studies showed that being a smoker is not great for lung cancer outcomes! But today—with targeted therapies—the data on how smoking affects different EGFR types is limited! That's why we looked into how smoking status impacts EGFR mutation status.

2. Materials and Methods

Study Design & Criteria: We included everyone aged 20 to 80 years who got diagnosed with lung cancer while getting care at Government Rajaji Hospital between June 2023 and September 2024 for this descriptive cross - sectional study.

Data Collection Techniques & Management: We created a structured form to gather data by looking through medical records of participants. Important details like age, gender, smoking history & the type of lung cancer were pulled out carefully. This helped us get accurate data about their health journey. The gathered info was then saved securely on an electronic database managed by trained staff aiming at accuracy.

Statistical Analysis: We used simple statistics to analyse the data. Categorical variables were shown as numbers (percentages). The results helped us see patterns of lung cancers across various ages and genders.

3. Results

Of the total of 90 patients with confirmed cases of lung cancer—61 (67.77%) were men while29 (32.22%) were women.

Table 1: Gender Wise Distribution of the Study Group

Gender	Number of Patients (%)
Male	61 (67.77%)
Female	29 (32.22%)
Total	90

Among these patients, 74 individuals (82.22%) had adenocarcinoma confirmed through histology while16 patients (17.77%) had squamous cell carcinoma identified.

Table 2: Distribution of Histopathologic Variants on Study Population

Histpathology	Number of Patients (%)
Adenocarcinoma	74 (82.22%)
Squamous Cell Carcinoma	16 (17.77%)
Total	90

In our study, we found that 23 patients (25.5%) had EGFR Mutations. There were also patients (3.33%) with ALK Mutations & just 1 patient (1.11%) showed a ROS1 Mutation.

Table 3: Incidence of Various Mutations among Study Population

Mutation	Number of Patients (%)
EGFR	23 (25.5%)
ALK	3 (3.33%)
ROS1	1 (1.11%)

Only 1 Patient (1.11%) was aged between 20 - 35 years & this one was found to have an EGFR Mutation. In the age group of 35 - 50, there were 24 patients (26.66%). Of those, 11 patients (47%) had EGFR Mutation positive results, & 1 patient (4.16%) had ALK Mutation positive results.

In the next age group, which is 51 - 65, we encountered 36 Patients (40%). Out of these, 13 patients (36%) had EGFR Mutation positive results, & only 1 patient (2.77%) had ALK Mutation positive.

For the oldest age group, which is 65 - 80 years old, we had 43 Patients (47%). Out of these, 17 Patients (39%) expressed EGFR Mutation Positive results, plus 1 Patient (2.32%) showed ALK Mutation Positive findings & another Patient (2.32%) for ROS1.

Table 4: Across Various Age Distribution of Three Driver Mutations Groups

Age Group in Years	Number of Patients (%)	EGFR	ALK	ROS 1
20 - 35	1 (1.11%)	1 (100%)	-	-
35 - 50	24 (26.6%)	11 (47%)	1 (4.16%)	-
51 - 65	36 (40%)	13 (36%)	1 (2.77%)	-
65 - 80	43 (47%)	17 (39%)	1 (2.32%)	1 (2.32%)

Among the EGFR mutant population, there were 15 males (65.21%), while only 8 females comprised the rest of the group (34.78%).

Table 5: Gender Wise Distribution of EGFR Mutant Study Population

Gender	Number of EGFR Mutant Population (%)
Male	15 (65.21%)
Female	8 (34.78%)
Total	23

Interestingly, fewer smokers were identified in the EGFR Mutant Population just 30.43% accounted for this group with only 7 Patients, while non - smokers made up a larger portion at about 69.5% or 16 Patients.

Table 6: Incidence of Smoking among Various EGFR Mutant Study Population

Smoking Status	Number of EGFR Mutant Population (%)
Smoker	7 (30.43%)
Non-Smoker	16 (69.5%)

4. Discussions

It's been found before that there's a higher frequency of EGFR mutations in Asian women who have never smoked. For instance, in a large study across many Asian countries, around 60% had this mutation. When looking at non - Asians compared to Asians—lower incidences were reported: about 25% versus nearly half—in some cases.

Among the types of lung cancer that aren't small cell type, adenocarcinoma is most common when checking for these mutations! A small share of squamous cell carcinomas showed some signs too—only about a blink - and - you - miss - it percentage of around 1%. In a big study done in Spain with over two thousand cases of non - small cell lung cancer, only about sixteen percent showed any mutations.

We noted that our sample revealed just over a quarter (25.5%) had EGFR mutations which aligns somewhat closely with data from Japan and East Asia along with Indian stats too. It's slightly above what Chougule A found at just under a quarter and lower than what Sahoo et al discovered in their work. Fascinatingly, it turns out that in males within our study group had a higher prevalence of these mutations at around two - thirds. This contrasts with other studies seen in Europe and Spain where it was often quite different.

When we check on ALK rearrangements globally—they vary from being seen in about 2 to 8 percent among non - small cell lung cancers—ours was right in the middle at around 3.4%. The typical average age for ALK rearrangements stands near fifty - one years whereas in our study; it was slightly younger at forty - eight years.

As for smoking—we know it tends to lower chances for an EGFR mutation being present. In a detailed analysis across twenty - six studies covering around thirty - six hundred patients with NSCLC—smokers naturally had lower mutation rates compared to non - smokers who retained much higher rates at almost seventy percent versus just thirty.

5. Conclusion

Summing things up—it seems like our findings suggest that lung cancer cases are more common among females when comparing both Indian data and global figures too! The frequency regarding the incidence of mutations like EGFR, ALK & ROS are pretty similar to what's seen around Asia & other places as well! And interestingly enough—the rate for EGFR mutations showed higher numbers for non - smokers—just like much research from Asia indicates.

While these observations highlight some favourable trends, they do come with limitations since they come from retrospective data collection and sample size isn't massive either.

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