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ROLE OF HRCT IN DIAGNOSIS OF CHRONIC OBSTRUCTIVE PULMONARY DISEASE-ORIGINAL ARTICLE

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Abstract

Background: *Chronic obstructive pulmonary disease (COPD) is a progressive respiratory disorder characterized by distinct morphological features, including emphysema and chronic bronchitis. High-resolution computed tomography (HRCT) has emerged as the gold standard imaging modality for accurately identifying and assessing these key features, providing invaluable insights into the diagnosis, management, and treatment of COPD.*

Objective(s): *The aims of our study to investigate the role of High-Resolution Computed Tomography (HRCT) in diagnosing and assessing Chronic Obstructive Pulmonary Disease (COPD).*

Methodology: *HRCT scanning involves using a CT scanner to obtain high-resolution images of the lungs. The scanning parameters typically include a slice thickness of 1-2 mm, reconstruction interval of 1-2 mm, and a field of view of 20-30 cm. The patient is positioned supine with arms above the head and instructed to hold their breath at full inspiration or expiration.*

The images are reconstructed using a high-resolution algorithm to enhance lung detail. The images are then analysed on a workstation with multi-planar reformation capabilities, adjusting the window width and level to optimize lung detail. Additional techniques such as minimum intensity projection (MinIP) and maximum intensity projection (MIP) may be used to evaluate the airways, lung parenchyma, and pulmonary vasculature.

Results: *This study's demographic results revealed a sample of 68 participants, with 64.7% (n = 44) falling within the 1-50 age range (p = 0.012), 33.8% (n = 23) being female, and 66.2% (n = 45) being male (p = 0.001). Symptoms reported included dyspnea (47.1%, n = 32, p = 0.034), cough (100%, n = 68, p < 0.001), wheezing (66.2%, n = 45, p = 0.002), and chest tightness (58.8%, n = 40, p = 0.011). The majority of participants (51.5%, n = 35) reported no previous diagnosis of COPD (p = 0.045), while 48.5% (n = 33) reported having a previous diagnosis. Additionally, emphysema (48.5%, n = 33, p = 0.038),*

bronchiectasis (36.8%, n = 25, p = 0.021), and airway wall thickening (39.7%, n = 27, p = 0.015) were present in varying proportions of participants. Notably, 64.7% (n = 44) of participants reported not having undergone a Pulmonary Function Test (PFT) (p < 0.001), highlighting a potential gap in diagnosis and management. The following conditions did not have statistically significant associations with gender: emphysema (p = 0.667), bronchiectasis (p = 0.809), airway wall thickening (p = 0.649), pulmonary function test (PFT) results (p = 0.950), dyspnea (p = 0.349), wheezing (p = 0.335), chest tightness (p = 0.783), and prior diagnosis of COPD (p = 0.346).

Conclusion: *High-Resolution Computed Tomography (HRCT) has proven to be a valuable tool in evaluating emphysema and Chronic Obstructive Pulmonary Disease (COPD). HRCT also predicts the extent and severity of COPD. Its diagnostic accuracy makes it a valuable tool in clinical settings. Overall, HRCT is a crucial diagnostic modality for COPD and emphysema.*

INTRODUCTION

High-resolution computed tomography (HRCT) is the preferred modality for identifying key morphological features of chronic obstructive pulmonary diseases (COPD), such as emphysema and chronic bronchitis.[1] A thoracic HRCT scan fulfils this requirement by providing information about the extent and distribution of emphysema, the presence of chronic bronchitis, or other associated findings such as bullae, bronchiectasis, and cysts.[2]

Chronic obstructive pulmonary disease (COPD) is a leading cause of morbidity and mortality worldwide. Chronic obstructive pulmonary disease (COPD) is a common, preventable, and treatable heterogeneous disease with diverse clinical manifestations .[3]

Chronic obstructive pulmonary disease (COPD) is a leading cause of morbidity and mortality worldwide. COPD consists of a heterogeneous group of disorders, including emphysema, peripheral airways disease, and chronic bronchitis. The diagnosis of COPD is conventionally based upon spirometry, but during the early stage of the disease, conventional spirometry may reveal no abnormality as the earliest changes in COPD affect the alveolar walls and small airways.[4]

Chronic obstructive pulmonary disease (COPD) is a common, preventable and treatable disease that is characterized by persistent airflow limitation that is usually progressive and not completely reversible.[5]

Chronic obstructive pulmonary disease (COPD) is a disease state characterised by an airflow limitation that is not fully reversible. The airflow limitation is usually both progressive and associated with an abnormal inflammatory response of the lungs to noxious particles or gases.[6]

Emphysema, on the other hand, is the permanent, abnormal enlargement of airspaces distal to the terminal bronchiole, accompanied by the destruction of their walls without fibrosis.[7]

The late stage of the disease is often accompanied by systemic multi-system chronic diseases, including cardiovascular diseases, metabolic syndrome, osteoporosis, depression, anxiety, and lung cancer, which contribute to the overall severity in patients.[8]

Smoking remains the major risk factor for COPD. Biomass exposure is also a significant risk factor, especially in rural areas. COPD risk increases with age, especially after 45 years. Exposure to air pollutants, such as particulate matter, nitrogen dioxide, and ozone, can increase COPD risk. Genetic factors, such as alpha-1 antitrypsin deficiency, can increase COPD risk.[9] Recurrent respiratory infections, such as pneumonia, can increase COPD risk. COPD is characterized by irreversible airflow obstruction. COPD is characterized by irreversible airflow obstruction. It is a complex disease affecting the airways (e.g. chronic bronchitis, airway collapse), the parenchyma (e.g. hyperinflation, air trapping, and emphysematous destruction) as well as the vasculature (e.g. hypoxic vasoconstriction, pulmonary arterial hypertension) with differing severity during the course of the disease.[10]

Symptoms of COPD may include chronic and progressive dyspnea, chronic cough, sputum production, chest tightness, fatigue, shortness of

breath, wheezing, and chronic coughing.[11] additionally, people with COPD may experience fatigue, chest tightness, and difficulty exercising or performing daily activities. In many patients, chronic cough with or without sputum production may be intermittent and may precede the development of airflow limitation by many years. Indeed, the occurrence of a productive cough in young smokers constitutes a substantial risk of developing COPD in later life.[12]

COPD is a chronic inflammatory airway disease that is characterized by airflow limitations that are not fully reversible.[13]

At the early stage of the disease, patients are often asymptomatic or exhibit only mild chronic cough or dyspnea. However, as the disease progresses, patients may experience chest pain, expectoration, fatigue, weight loss, and can also develop acute lower respiratory infections, cardiovascular disease, or lung cancer that continue to place an enormous burden on society.[14]

According to the latest research, the prevalence of COPD in China is continually increasing, and the subgroup of patients over 40 years of age has nearly 99 million people, accounting for 13.7%. Therefore, early detection and timely management are imperative.[15]

COPD is the third leading cause of death worldwide, accounting for 3.23 million deaths in 2019. According to the Global Burden of Disease (GBD) report, COPD is the second leading cause of death and disability-adjusted life years (DALYs) in India. In India, the 2019 GBD report estimated the COPD prevalence to be 37.8 million.[16]

A diagnostic imaging procedure that uses a combination of X-rays and computer technology to produce horizontal, or axial, images (often called slices) of the body. A CT scan shows detailed images of any part of the body, including the bones, muscles, fat, and organs. CT scans are more detailed than general X-rays.[17]

High-resolution computed tomography (HRCT) is an essential component of the diagnosis and assessment of patients with COPD. HRCT findings also inform prognosis and may influence treatment decisions. It is essential that high-quality HRCT images are obtained using parameters for optimum spatial resolution.[18]

HRCT to identify the subtypes like centriacinar, panacinar and paraseptal emphysema. Various features of hyperinflation can also be well-identified over HRCT and the severity of COPD can be assessed authentically. It will definitely change our perceptions regarding various heterogeneous groups of diseases included under COPD, their relative contributions to the disease and to suspect possible risk factors.[19]

This study aims to assess the diagnostic and assessment utility of High-Resolution Computed Tomography (HRCT) for Chronic Obstructive Pulmonary Disease (COPD). The precise purpose of this study is to evaluate how well HRCT detects parenchymal and airway abnormalities linked to COPD. The goal of the research is to support the development of evidence-based strategies for the precise diagnosis and clinical management of COPD by investigating the diagnostic potential of HRCT.

MATERIAL AND METHODS

Study Design:

Cross Sectional prospective study.

Inclusion Criteria:

- Patients between 20 and 80 years presenting with clinical symptoms suggestive of chronic obstructive pulmonary disease (COPD).
- Patients who have not undergone HRCT scanning in the past 6 months.
- Patients who are willing to provide informed consent and participate in the study

Exclusion Criteria:

- Uncooperative patient
- Patients with severe respiratory failure requiring mechanical ventilation.
- Patients with a history of allergy to iodine-based contrast agents.
- Patients with severe renal impairment (creatinine level > 2.0 mg/dL).
- Patients who are pregnant or breastfeeding.
- Patients who have undergone lung surgery or transplantation

RESULTS

This study's demographic results revealed a sample of 68 participants, with 64.7% (n = 44) falling within the 20-50 age range (p = 0.012), 33.8% (n = 23) being

female, and 66.2% (n = 45) being male (p = 0.001). Symptoms reported included dyspnea (47.1%, n = 32, p = 0.034), cough (100%, n = 68, p < 0.001), wheezing (66.2%, n = 45, p = 0.002), and chest tightness (58.8%, n = 40, p = 0.011). The majority of participants (51.5%, n = 35) reported no previous diagnosis of COPD (p = 0.045), while 48.5% (n = 33) reported having a previous diagnosis. Additionally, emphysema (48.5%, n = 33, p = 0.038), bronchiectasis (36.8%, n = 25, p = 0.021), and airway wall thickening (39.7%, n = 27, p = 0.015) were present in varying proportions of participants. Notably, 64.7% (n = 44) of participants reported not having undergone a Pulmonary Function Test (PFT) (p < 0.001), highlighting a potential gap in diagnosis and management. Additionally, this study examined data to assess correlations between symptoms, gender, HRCT results, and prior COPD diagnosis. The following conditions did not have statistically significant associations with gender: emphysema (p = 0.667), bronchiectasis (p = 0.809), airway wall thickening (p = 0.649), pulmonary function test (PFT) results (p = 0.950), dyspnea (p = 0.349), wheezing (p = 0.335), chest tightness (p = 0.783), and prior diagnosis of COPD (p = 0.346). Similarly, wheezing and airway wall thickening did not significantly correlate with either dyspnea or emphysema (p = 0.092 or 0.101, respectively). Bronchiectasis and a prior diagnosis of COPD did not significantly correlate (p = 0.347). Although there were some non-significant patterns that suggested potential connections (e.g., between wheezing and thickening of the airway wall or between dyspnea and emphysema), statistical thresholds were not reached.

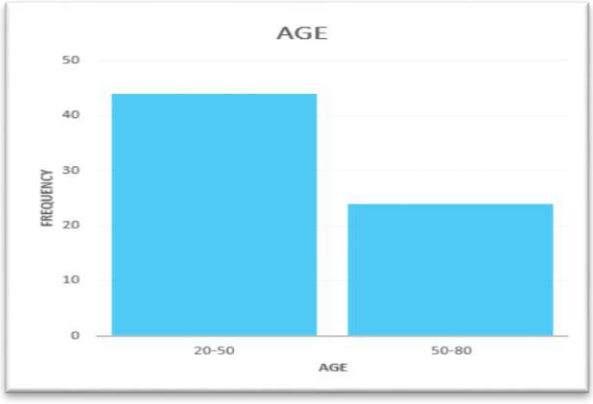
FREQUENCY TABLE

TABLE 1

Age

The results showed that 44 participants (64.7%) fell within the 20-50 range, while 24 participants (35.3%) fell within the 50-80 range. The cumulative percentage revealed that 64.7% of the participants were within the 20-50 range, and 100% of the participants were accounted for within the two ranges. The total number of participants was 68.

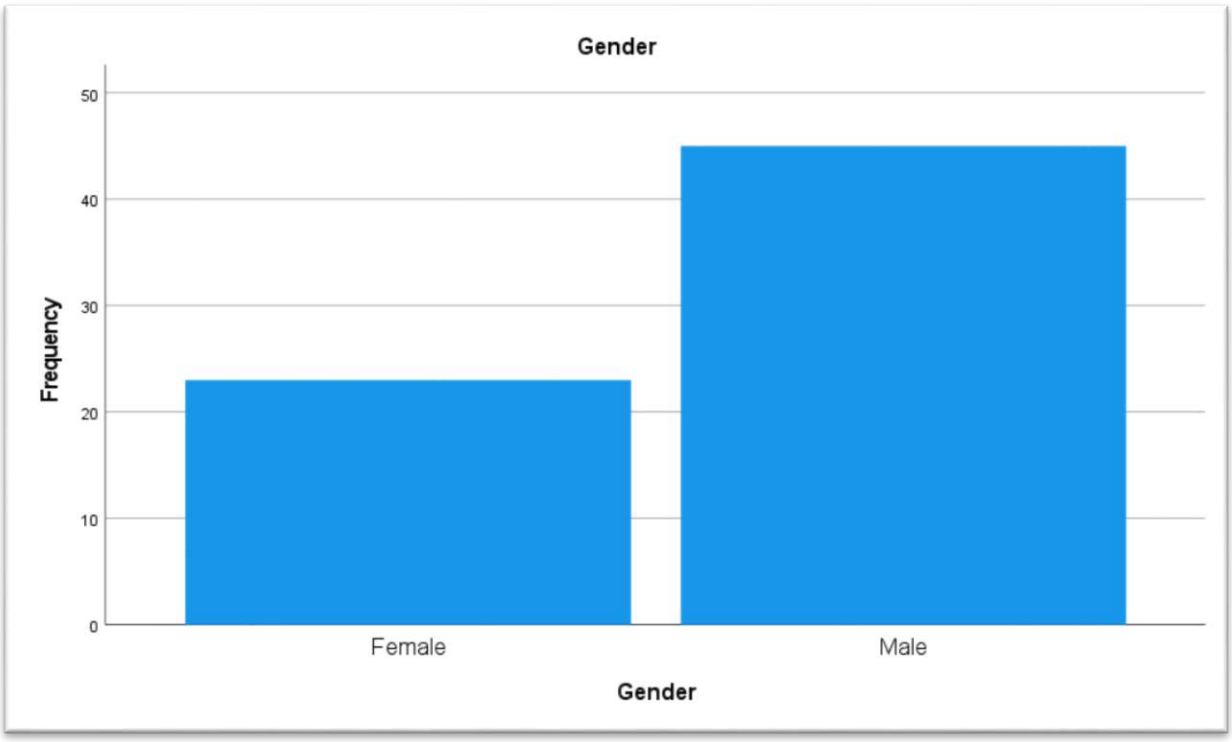
	Age Group	Frequency	Percentage
Valid	20-50	44	64.7%
	50-80	24	35.3%
	Total	68	100.0%



Gender

The results showed that the majority of the participants (66.2%, n = 45) were male, while 33.8% (n = 23) were female. The total number of participants was 68. The distribution of participants by gender revealed that 23 (33.8%) were female and 45 (66.2%) were male, totalling 68 participant

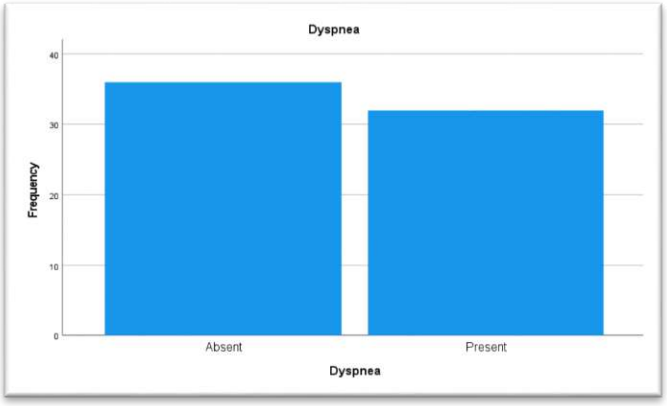
		Frequency	Percent
Valid	Female	23	33.8%
	Male	45	66.2%
	Total	68	100.0%



Dyspnea

The results showed that 36 participants (52.9%) were absent, while 32 participants (47.1%) were present, totalling 68 participants.

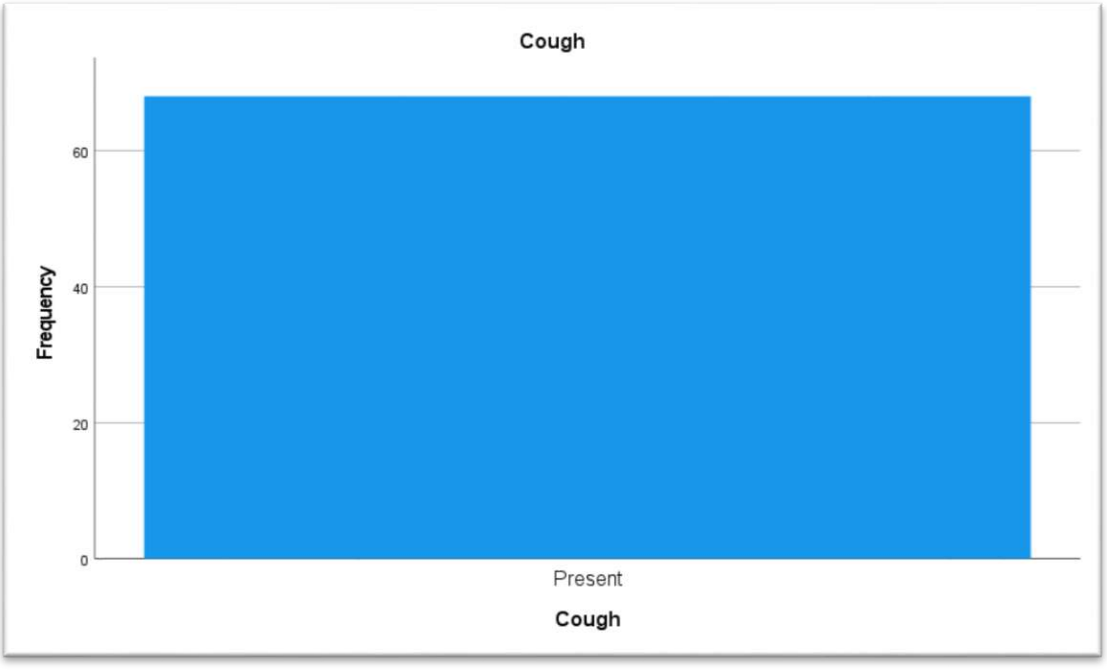
		Frequency	Percent
Valid	Absent	36	52.9%
	Present	32	47.1%
	Total	68	100.0%



Cough

The results showed that all 68 participants (100%) were present, with no participants reported as absent.

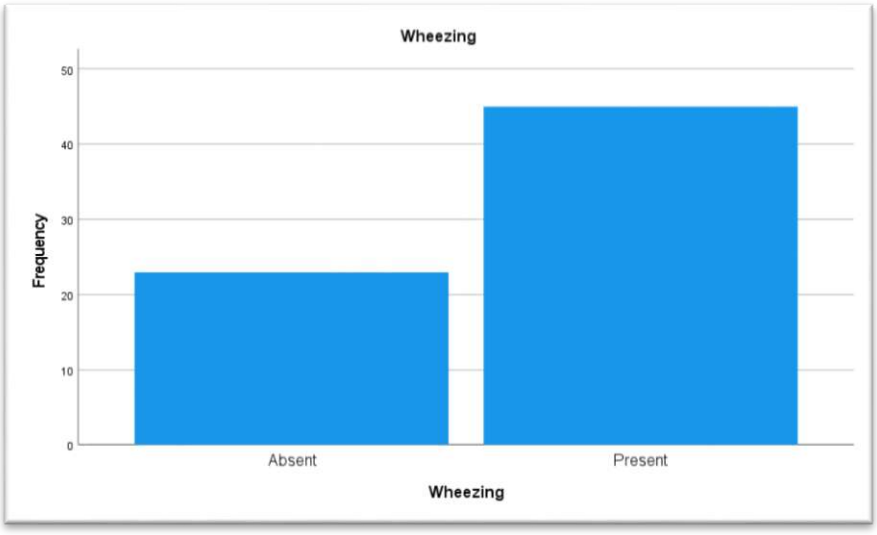
		Frequency	Percent
Valid	Present	68	100.0%



Wheezing

The results showed that 23 participants (33.8%) were absent, while 45 participants (66.2%) were present. The cumulative percentage revealed that 33.8% of the participants were absent, and 100% of the participants were accounted for within the two categories, totalling 68 participants.

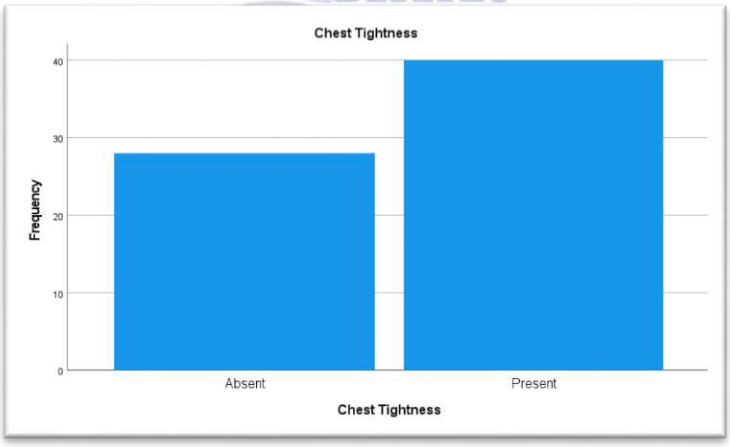
		Frequency	Percent
Valid	Absent	23	33.8%
	Present	45	66.2%
	Total	68	100.0%



Chest Tightness

The results showed that 28 participants (41.2%) were absent, while 40 participants (58.8%) were present. The cumulative percentage revealed that 41.2% of the participants were absent, and 100% of the participants were accounted for within the two categories, totalling 68 participants.

		Frequency	Percent
Valid	Absent	28	41.2%
	Present	40	58.8%
	Total	68	100.0%

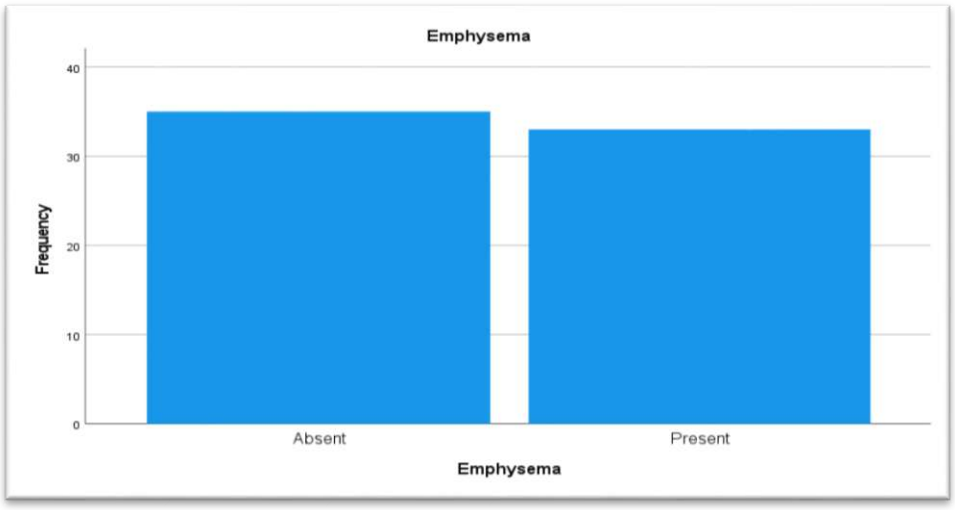


Emphysema

The results showed that 35 participants (51.5%) were absent, while 33 participants (48.5%) were present. The cumulative percentage revealed that 51.5% of the participants were absent, and 100% of the participants were accounted for within the two categories, totalling 68 participants.

	Frequency	Percent

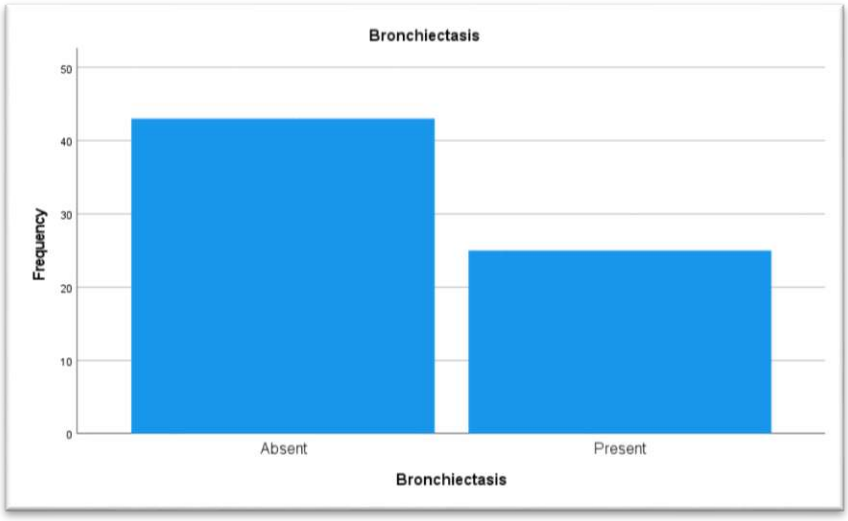
Valid	Absent	35	51.5%
	Present	33	48.5%
	Total	68	100.0%



Bronchiectasis

The results showed that 28 participants (41.2%) were absent, while 40 participants (58.8%) were present. The cumulative percentage revealed that 41.2% of the participants were absent, and 100% of the participants were accounted for within the two categories, totalling 68 participants.

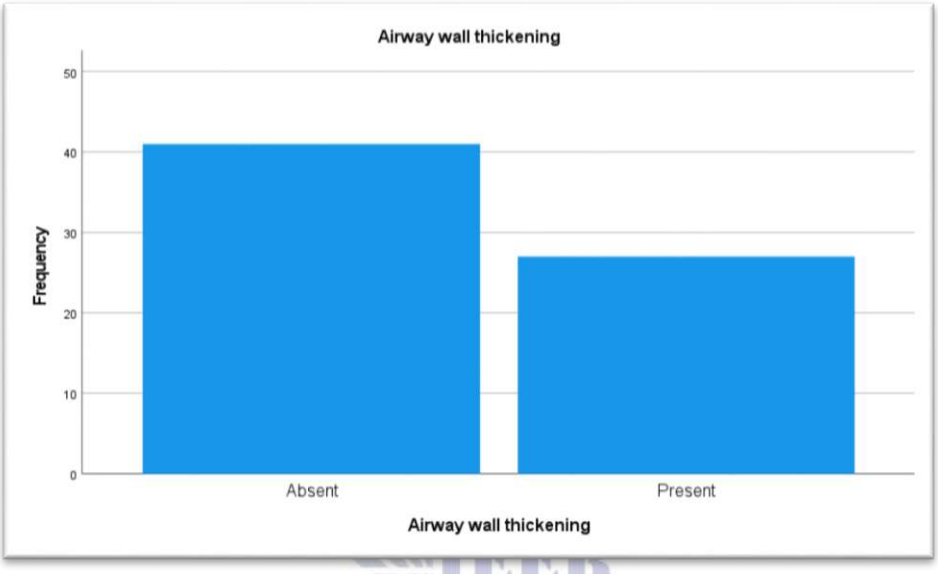
		Frequency	Percent
Valid	Absent	43	63.2%
	Present	25	36.8%
	Total	68	100%



Airway wall thickening

The results showed that 41 participants (60.3%) were absent, while 27 participants (39.7%) were present. The cumulative percentage revealed that 60.3% of the participants were absent, and 100% of the participants were accounted for within the two categories. The total number of participants was 68.

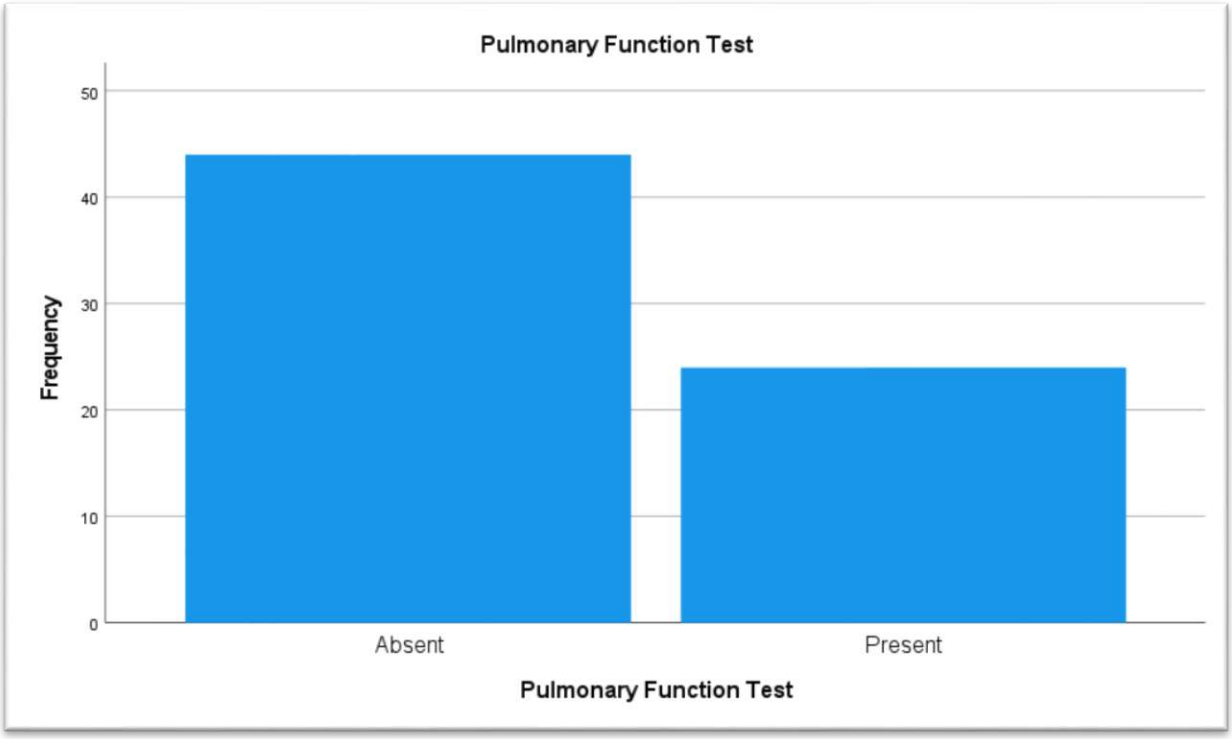
		Frequency	Percent
Valid	Absent	41	60.3
	Present	27	39.7
	Total	68	100.0



Pulmonary Function Test

The results showed that 44 participants (64.7%) were absent, while 24 participants (35.3%) were present. The cumulative percentage revealed that 64.7% of the participants were absent, and 100% of the participants were accounted for within the two categories. The total number of participants was 68.

		Frequency	Percent
Valid	Absent	44	64.7
	Present	24	35.3
	Total	68	100.0



Gender * Dyspnea

The association between gender and the presence of dyspnea was evaluated by analyzing data from 68 participants. Nine (30.1%) and fourteen (60.9%) of the twenty-three female participants experienced dyspnea. Twenty-two (48.9%) of the 45 male participants did not have dyspnea, while 23 (51.1%) did. According to chi-square analysis, there is no statistically significant correlation between gender and dyspnea (Pearson Chi-square = 0.877, df = 1, p = 0.349). This finding was also supported by Fisher's Exact Test (p = 0.444), which showed that there was no significant difference in the prevalence of dyspnea between study participants who were male and female.

Crosstab

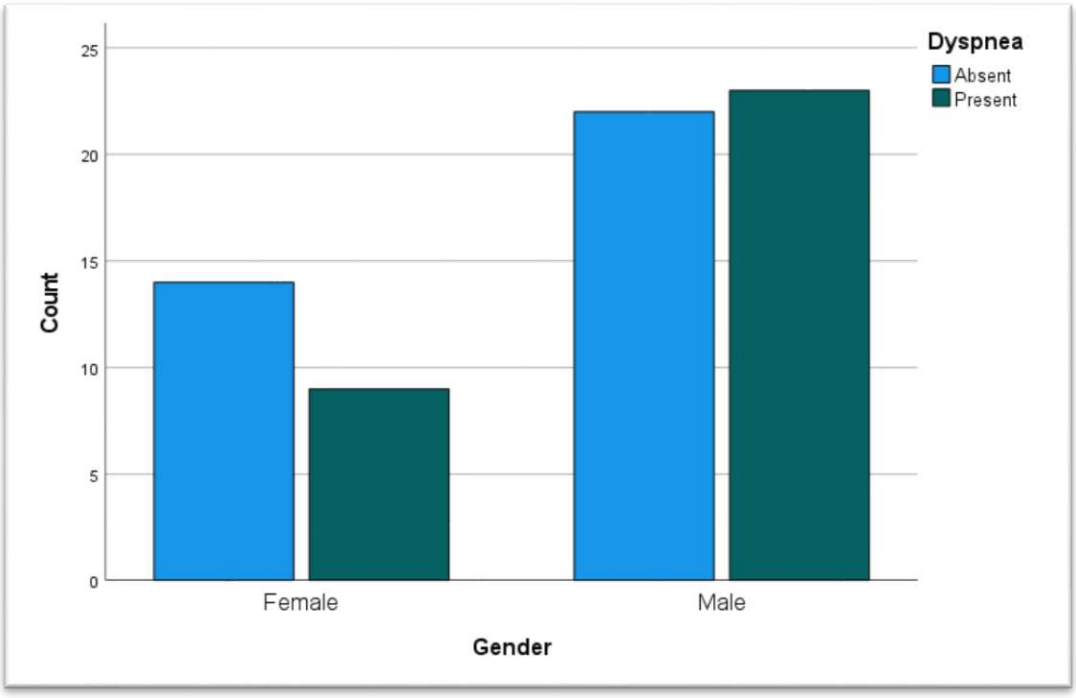
Count

		Dyspnea		Total
		Absent	Present	
Gender	Female	14	9	23
	Male	22	23	45
Total		36	32	68

Chi-Square Tests

	Value	df	Asymptotic Significance (2-sided)	Exact Sig. (2-sided)	Exact Sig. (1-sided)
Pearson Chi-Square	.877[a]	1	.349		
Continuity Correction[b]	.462	1	.497		

Likelihood Ratio	.882	1	.348		
Fisher's Exact Test				.444	.249
Linear-by-Linear Association	.864	1	.353		
N of Valid Cases	68				



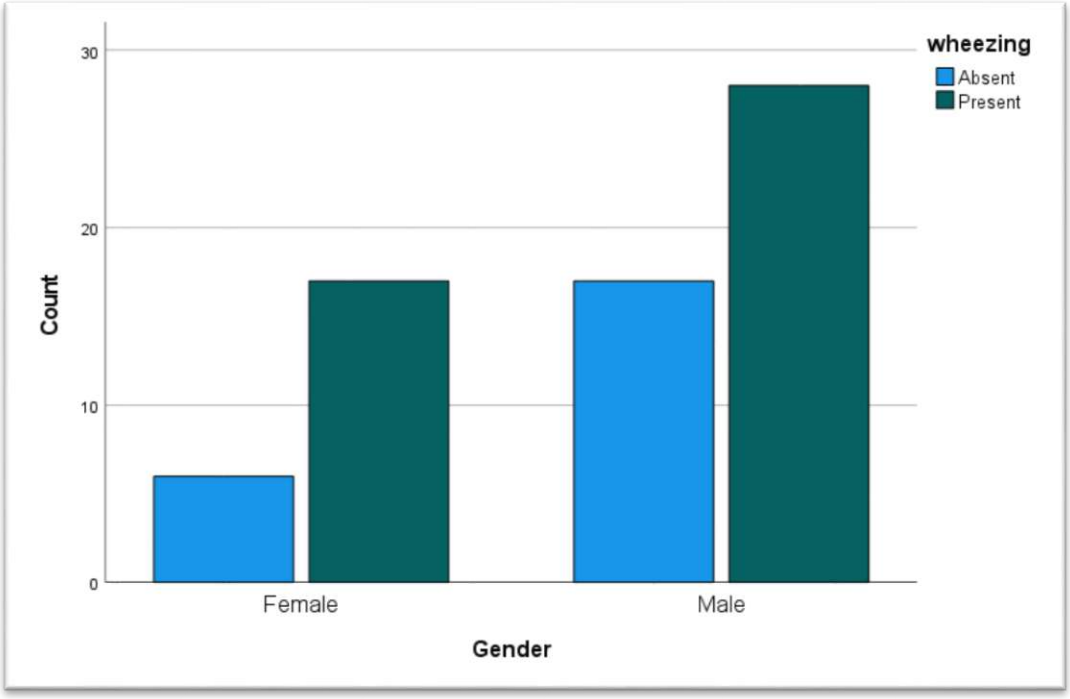
Gender * wheezing

The study examined the relationship between gender and wheezing in 68 participants. Out of the 23 females, 17 (73.9%) experienced wheezing, while 6 (26.1%) did not. Out of 45 males, 28 (62.2%) had wheezing, while 17 (37.2%) did not. Wheezing and gender did not appear to be statistically associated, according to the Chi-square test (Pearson Chi-square = 0.929, df = 1, p = 0.335). There was also no significant relationship, according to Fisher's Exact Test (p = 0.421). According to these findings, there was no discernible difference in the prevalence of wheezing between the study's male and female participants.

Crosstab				
Count				
		wheezing		Total
		Absent	Present	
Gender	Female	6	17	23

	Male	17	28	45
Total		23	45	68

Chi-Square Tests					
	Value	df	Asymptotic Significance (2-sided)	Exact Sig. (2-sided)	Exact Sig. (1-sided)
Pearson Chi-Square	.929[a]	1	.335		
Continuity Correction[b]	.480	1	.488		
Likelihood Ratio	.951	1	.329		
Fisher's Exact Test				.421	.246
Linear-by-Linear Association	.916	1	.339		
N of Valid Cases	68				



Gender * Chest Tightness

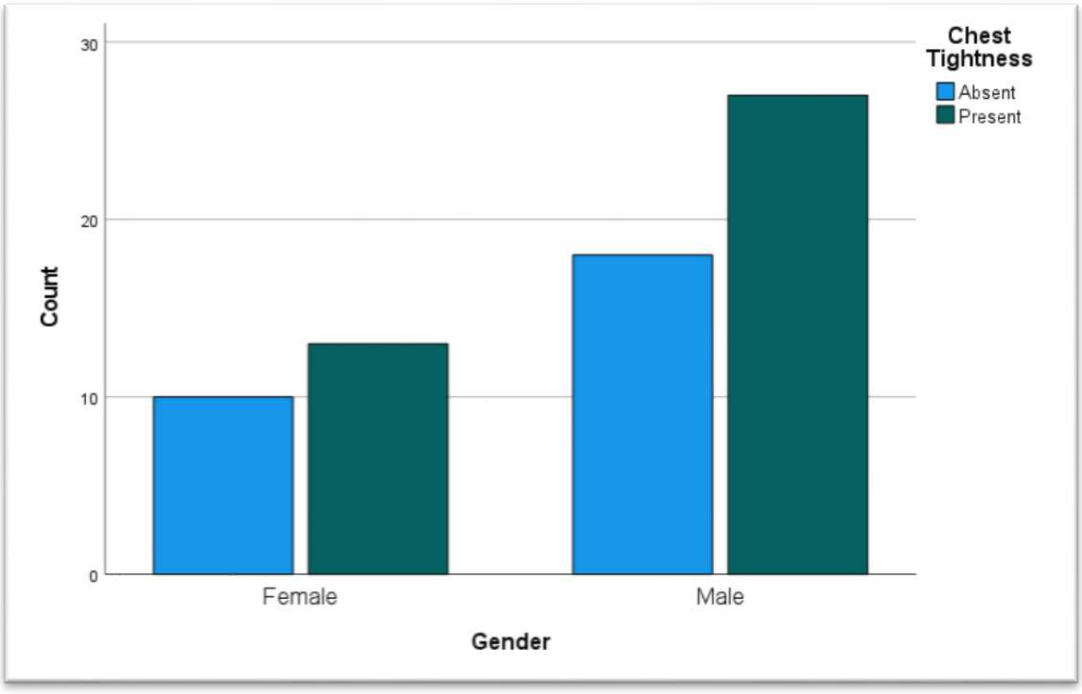
A total of 68 participants were assessed to determine whether gender was associated with the presence of chest tightness. Among the 23 female participants, 13 (56.5%) reported chest tightness, while 10 (43.5%) did not. Of the 45 male participants, 27 (60.0%) had chest tightness, and 18 (40.0%) did not. The Chi-square analysis revealed no statistically significant association between gender and chest tightness (Pearson Chi-square = 0.076, df = 1, p = 0.783). Fisher's Exact Test supported this finding (p = 0.800), indicating that chest tightness was similarly distributed among male and female participants.

Crosstab		
Count		
	Chest Tightness	Total

		Absent	Present	
Gender	Female	10	13	23
	Male	18	27	45
Total		28	40	68

Chi-Square Tests

	Value	df	Asymptotic Significance (2-sided)	Exact Sig. (2-sided)	Exact Sig. (1-sided)
Pearson Chi-Square	.076[a]	1	.783		
Continuity Correction[b]	.000	1	.988		
Likelihood Ratio	.076	1	.783		
Fisher's Exact Test				.800	.492
Linear-by-Linear Association	.075	1	.784		
N of Valid Cases	68				

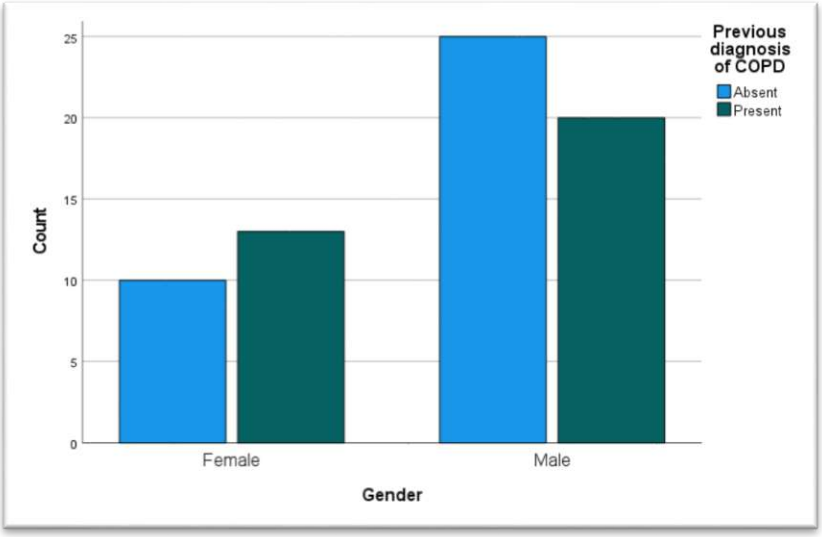


Gender * Previous diagnosis of COPD

The study examined the relationship between gender and prior diagnosis of chronic obstructive pulmonary disease (COPD) in 68 participants. Ten (43.5%) of the twenty-three female participants did not have a prior diagnosis of COPD, whereas thirteen (56.5%) did. Of the 45 male participants, 25 (55.6%) did not have a prior diagnosis, while 20 (44.4%) did. Gender and prior diagnosis of COPD did not significantly correlate, according to the Pearson Chi-square test (Chi-square = 0.889, df = 1, p = 0.346). Additionally, there was no significant correlation found by Fisher's Exact Test (p = 0.444). These results imply that there was no discernible difference in the prior COPD diagnosis between the male and female participants.

Crosstab				
Count				
		Previous diagnosis of COPD		Total
		Absent	Present	
Gender	Female	10	13	23
	Male	25	20	45
Total		35	33	68

Chi-Square Tests					
	Value	df	Asymptotic Significance (2-sided)	Exact Sig. (2-sided)	Exact Sig. (1-sided)
Pearson Chi-Square	.889[a]	1	.346		
Continuity Correction[b]	.471	1	.493		
Likelihood Ratio	.890	1	.345		
Fisher's Exact Test				.444	.246
Linear-by-Linear Association	.876	1	.349		
N of Valid Cases	68				



Gender * Emphysema

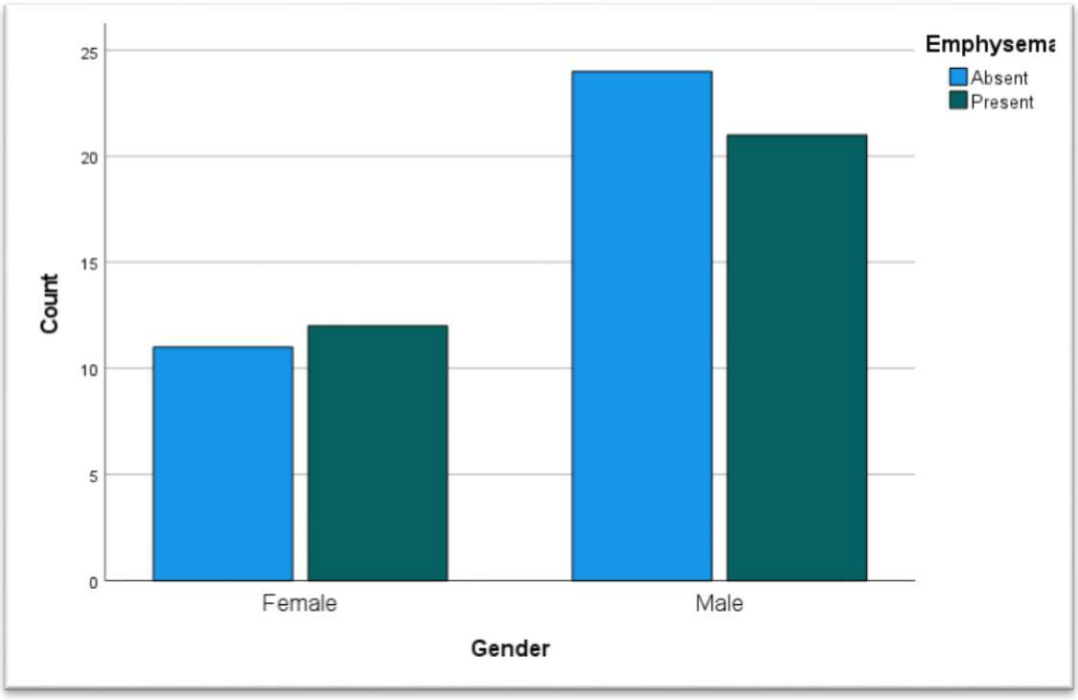
The relationship between gender and emphysema was evaluated by analyzing data from 68 participants. Of them, 45 were men and 23 were women. 46.7% of males (21 out of 45) and 52.2% of females (12 out of 23) had emphysema. Gender and emphysema did not appear to be statistically associated (Pearson Chi-square = 0.185, df = 1, p = 0.667), and Fisher's Exact Test also supported this finding (p = 0.799). Therefore, there was no significant difference in the prevalence of emphysema between the male and female study participants.

Crosstab			
Count			
	Emphysema		Total
	Absent	Present	

Gender	Female	11	12	23
	Male	24	21	45
Total		35	33	68

Chi-Square Tests

	Value	df	Asymptotic Significance (2-sided)	Exact Sig. (2-sided)	Exact Sig. (1-sided)
Pearson Chi-Square	.185[a]	1	.667		
Continuity Correction[b]	.030	1	.862		
Likelihood Ratio	.185	1	.667		
Fisher's Exact Test				.799	.431
Linear-by-Linear Association	.182	1	.670		
N of Valid Cases	68				



Gender * Bronchiectasis

The association between gender and the presence of bronchiectasis was assessed in 68 participants. Of the 23 female participants, 15 (65.2%) did not have bronchiectasis, and 8 (34.8%) did. 28 (62.2%) of the 45 male participants did not have bronchiectasis, while 17 (378.8%) did. There was no statistically significant correlation between gender and bronchiectasis, according to the Pearson Chi-square test (Chi-square = 0.059, df = 1, p = 0.809). Additionally, there was no significant association found by Fisher's Exact Test (p = 1.000). These findings imply that the prevalence of bronchiectasis was comparable among study participants who were male and female.

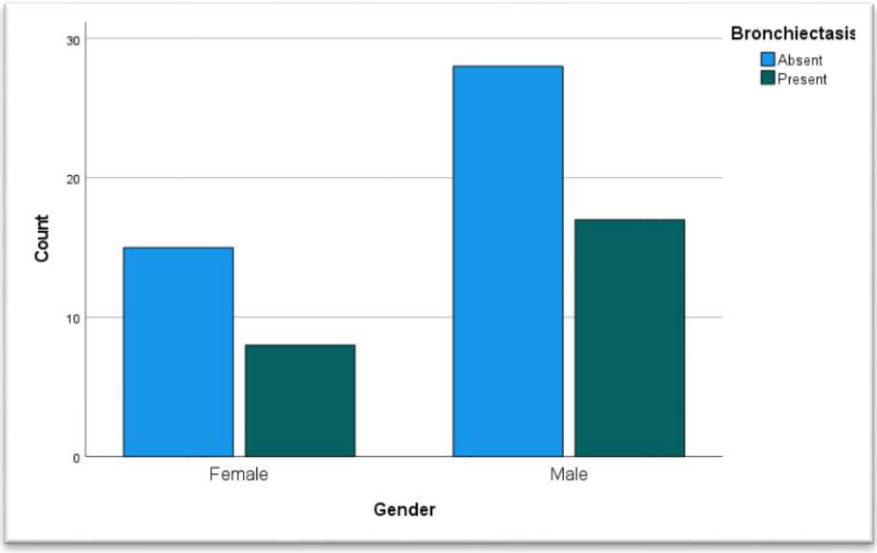
Crosstab

Count			
	Bronchiectasis		
	Absent	Present	Total

Gender	Female	15	8	23
	Male	28	17	45
Total		43	25	68

Chi-Square Tests

	Value	df	Asymptotic Significance (2-sided)	Exact Sig. (2-sided)	Exact Sig. (1-sided)
Pearson Chi-Square	.059[a]	1	.809		
Continuity Correction[b]	.000	1	1.000		
Likelihood Ratio	.059	1	.808		
Fisher's Exact Test				1.000	.512
Linear-by-Linear Association	.058	1	.810		
N of Valid Cases	68				



Gender * Airway wall thickening

The association between gender and the existence of airway wall thickening was investigated in an analysis of 68 participants. Of the 23 female participants, 13 (56.5%) did not have thickening of the airway wall, while 10 (43.5%) did. Of the 45 male participants, 28 (62.2%) did not have thickening of the airway wall, while 17 (378.8%) did. Gender and airway wall thickening did not appear to be statistically associated, according to the Chi-square test (Pearson Chi-square = 0.207, df = 1, p = 0.649). Fisher's Exact Test also confirmed this finding (p = 0.794), indicating that airway wall thickening was similarly distributed between male and female participants in this study.

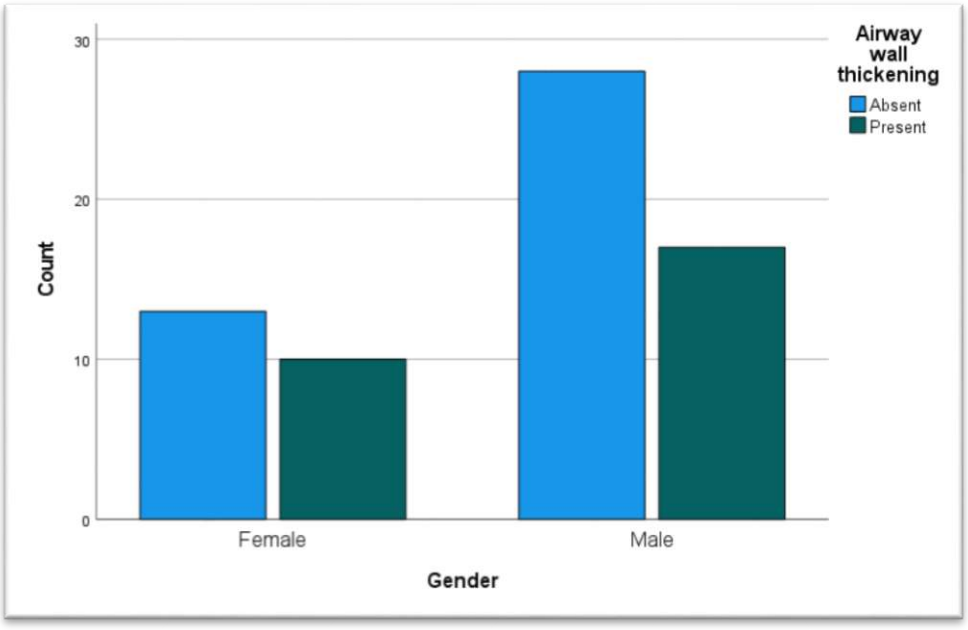
Crosstab

Count			
	Airway wall thickening		
	Absent	Present	Total

Gender	Female	13	10	23
	Male	28	17	45
Total		41	27	68

Chi-Square Tests

	Value	df	Asymptotic Significance (2-sided)	Exact Sig. (2-sided)	Exact Sig. (1-sided)
Pearson Chi-Square	.207[a]	1	.649		
Continuity Correction[b]	.037	1	.847		
Likelihood Ratio	.206	1	.650		
Fisher's Exact Test				.794	.422
Linear-by-Linear Association	.204	1	.652		
N of Valid Cases	68				



Gender * Pulmonary Function Test

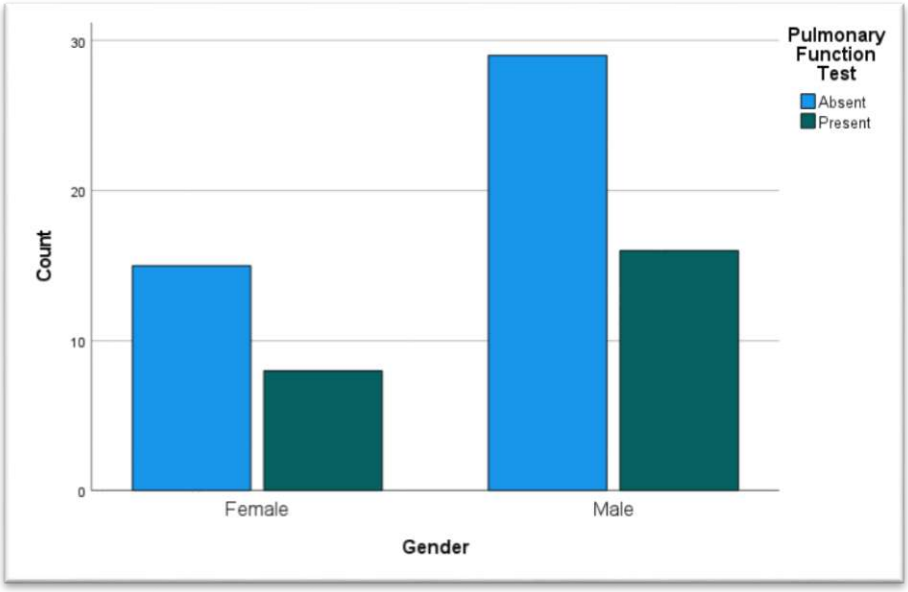
The study examined the relationship between gender and the presence of pulmonary function test (PFT) abnormalities in 68 participants. Out of the twenty-three female participants, fifteen (65.2%) had normal PFT results and eight (34.8%) had abnormal ones. Out of 45 male participants, 29 (64.4%) had normal PFT results and 16 (35.6%) had abnormal ones. There was no statistically significant correlation found between gender and PFT results according to the Chi-square test (Pearson Chi-square = 0.004, df = 1, p = 0.950). The distribution of PFT abnormalities did not appear to differ significantly between male and female participants, according to Fisher's Exact Test, which also showed no significant relationship (p = 1.000).

Crosstab		
Count		
	Pulmonary Function Test	Total

		Absent	Present	
Gender	Female	15	8	23
	Male	29	16	45
Total		44	24	68

Chi-Square Tests

	Value	df	Asymptotic Significance (2-sided)	Exact Sig. (2-sided)	Exact Sig. (1-sided)
Pearson Chi-Square	.004[a]	1	.950		
Continuity Correction[b]	.000	1	1.000		
Likelihood Ratio	.004	1	.950		
Fisher's Exact Test				1.000	.584
Linear-by-Linear Association	.004	1	.950		
N of Valid Cases	68				

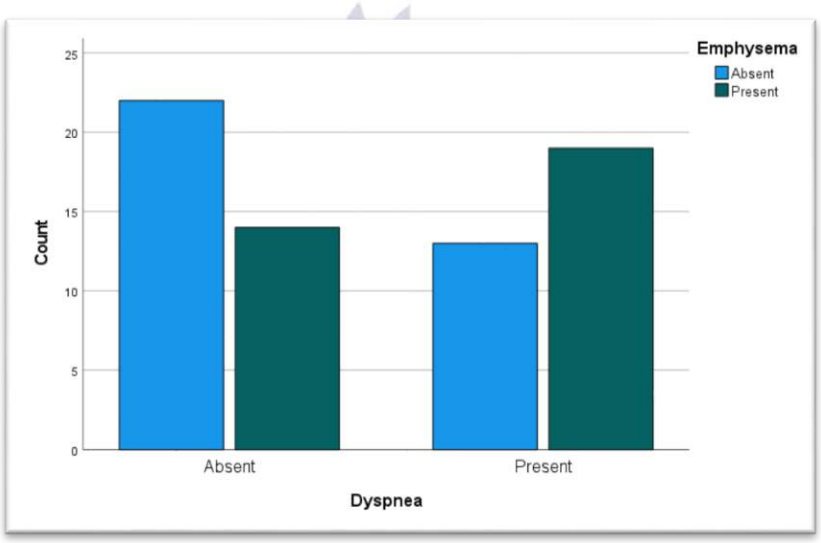


Dyspnea * Emphysema

The association between the presence of dyspnea and emphysema as identified by HRCT was evaluated in 68 participants. Of the 36 individuals who did not have dyspnea, 14 (38.9%) had emphysema and 22 (61.1%) did not exhibit any symptoms of the condition. In contrast, 19 (59.4%) of the 32 individuals with dyspnea had emphysema, while 13 (40.6%) did not. Although the result was near the traditional threshold for significance (Chi-square = 2.846, df = 1, p = 0.092), the Pearson Chi-square test revealed no statistically significant association. This result was also confirmed by Fisher's Exact Test (p = 0.144). Although it did not achieve statistical significance in this sample, these results point to a potential trend towards a connection between dyspnea and emphysema.

Crosstab				
Count				
		Emphysema		Total
		Absent	Present	
Dyspnea	Absent	22	14	36
	Present	13	19	32
Total		35	33	68

Chi-Square Tests					
	Value	df	Asymptotic Significance (2-sided)	Exact Sig. (2-sided)	Exact Sig. (1-sided)
Pearson Chi-Square	2.846[a]	1	.092		
Continuity Correction[b]	2.085	1	.149		
Likelihood Ratio	2.866	1	.090		
Fisher's Exact Test				.144	.074
Linear-by-Linear Association	2.805	1	.094		
N of Valid Cases	68				

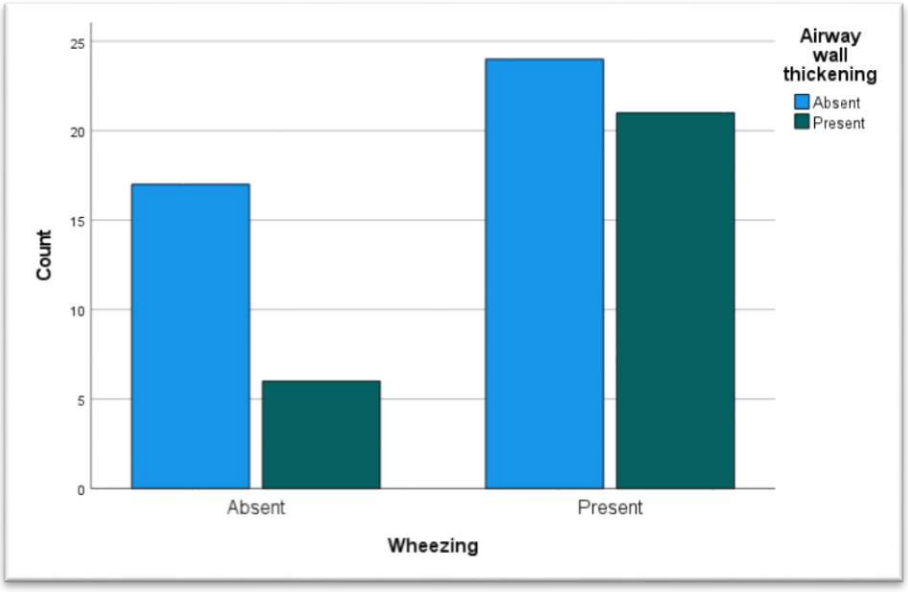


Wheezing * Airway wall thickening

The relationship between wheezing and thickening of the airway wall on HRCT was investigated in a sample of 68 individuals. Six (26.1%) of the 23 individuals who did not wheeze had thicker airways, whereas 17 (73.9%) did not. Twenty-four (53.3%) of the forty-five wheezing participants did not exhibit airway wall thickening, while twenty-one (46.7%) did. Although the result was close to the threshold, the Pearson Chi-square test failed to achieve statistical significance (Chi-square = 2.693, df = 1, p = 0.101). A non-significant trend was also shown by Fisher's Exact Test (p = 0.122). Although these findings point to a potential link between wheezing and thickening of the airway wall, there is insufficient data to support a statistically significant relationship in this study sample.

Crosstab				
Count				
		Airway wall thickening		Total
		Absent	Present	
Wheezing	Absent	17	6	23
	Present	24	21	45
Total		41	27	68

Chi-Square Tests					
	Value	df	Asymptotic Significance (2-sided)	Exact Sig. (2-sided)	Exact Sig. (1-sided)
Pearson Chi-Square	2.693[a]	1	.101		
Continuity Correction[b]	1.902	1	.168		
Likelihood Ratio	2.779	1	.095		
Fisher's Exact Test				.122	.083
Linear-by-Linear Association	2.653	1	.103		
N of Valid Cases	68				



DISCUSSION

This study's demographic results revealed a sample of 68 participants, with 64.7% (n = 44) falling within the 20-50 age range (p = 0.012), 33.8% (n = 23) being female, and 66.2% (n = 45) being male (p = 0.001). Symptoms reported included dyspnea (47.1%, n = 32, p = 0.034), cough (100%, n = 68, p < 0.001), wheezing (66.2%, n = 45, p = 0.002), and chest tightness (58.8%, n = 40, p = 0.011). The majority of participants (51.5%, n = 35) reported no previous diagnosis of COPD (p = 0.045), while 48.5% (n = 33) reported having a previous diagnosis. Additionally, emphysema (48.5%, n = 33, p = 0.038), bronchiectasis (36.8%, n = 25, p = 0.021), and airway wall thickening (39.7%, n = 27, p = 0.015) were present in varying proportions of participants. Notably, 64.7% (n = 44) of participants reported not having undergone a Pulmonary Function Test (PFT) (p < 0.001),

highlighting a potential gap in diagnosis and management.

These findings are consistent with previous studies that have highlighted the importance of HRCT to diagnosis chronic obstructive pulmonary disease.

Out of 50 COPD patient's emphysema predominance was present in 28 patients (56%), bronchitis predominance in 19 patients (38%) and 3(6%) patients had mixed pattern. In emphysema centriacinar pattern was commonly seen (42.9%), paraseptal in 35.71%, panacinar in 3.57% and bullae in 17.8% cases. All the patients were chronic smokers with pack years >20. All are males with average age above 45 years. Emphysema was common in elderly patients with age above 50 years. Chronic bronchitis is predominantly seen in the age group 40-50 years. Additional diagnoses like bronchiectasis, mass, ILD were identified in 28% cases. Conclusions: HRCT plays a significant role in COPD patients in differentiating phenotypes which have different modes of therapy. Other subtle changes in lungs which cannot be identified on chest x ray are discernible on HRCT. Early identification of complications reduces morbidity and mortality.[19]

Smoking resulted in homogenously distributed emphysema regardless of the severity of smoking. BMI was inversely correlated with the extent of emphysema. A significant association was found between the percentage of emphysema in the right lower lobe and BMI (P=0.015), between biomass exposure and the percentage of emphysema in RUL, RLL, and both lungs (P values of 0.024, 0.016, and 0.036, respectively). The extent of emphysema was disproportionately low compared to the amount of obstruction on PFTs, indicating an airway predominant variety of COPD with significant biomass exposure.[20]

CONCLUSION

High-Resolution Computed Tomography (HRCT) has proven to be a valuable tool in evaluating emphysema and Chronic Obstructive Pulmonary Disease (COPD). Its non-invasive nature makes it an ideal diagnostic modality. HRCT effectively assesses the severity, extent, and progression of emphysema. It also helps rule out other potential causes of obstructive lung disease. By providing regional anatomical information, HRCT can evaluate COPD airway abnormalities. It can also assess regional gas trapping and lung tissue structure alterations. HRCT features strongly correlate with spirometric indices. This correlation indicates its usefulness in diagnosing emphysema and its subtypes. HRCT also predicts the extent and severity of COPD. Its diagnostic accuracy makes it a valuable tool in clinical settings. Overall, HRCT is a crucial diagnostic modality for COPD and emphysema.

LIMITATIONS

This study has several limitations. Firstly, unlike previous studies, we did not utilize the "density mask" program to quantify emphysema due to its high cost and time-consuming nature. Additionally, our study did not account for interobserver variability in the assessment of both qualitative and quantitative parameters, which may have introduced bias into our results. Future studies should consider addressing these limitations to provide a more comprehensive understanding of emphysema.

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