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A Multidimensional Descriptive Analysis of Pulmonary Fibrosis: Clinical Profiles, Risk Factors, and Functional Impacts in Affected Patients

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تحليل متعدد الأبعاد للتغيرات السريرية والديموغرافية في مرضى التليف الرئوي: دراسة وصفية تحليلية لعوامل الخطر والتأثيرات الوظيفية

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Abstract
Pulmonary fibrosis is a progressive chronic lung disease characterized by the scarring and stiffening of lung tissues, leading to impaired gas exchange and gradual respiratory failure. This study aimed to analyze the demographic and physiological characteristics of patients with pulmonary fibrosis, identify key contributing factors such as smoking, occupational exposure, and genetic history, and assess the disease's impact on daily activities and quality of life. A total of 70 patients were included in the sample, and data were collected using a comprehensive questionnaire and statistically analyzed. The results showed that most participants were males and belonged to the older age group (60–79 years), with a mean oxygen saturation (SpO_2) of 59.16%, which is significantly lower than normal. A strong correlation was found between pulmonary fibrosis and a history of smoking, as well as occupational exposure to harmful substances such as bird proteins and volatile chemicals. Physical activity and the ability to work were the most affected aspects of daily life. The study recommends early screening programs, increased awareness of smoking risks and occupational hazards, and improved access to treatment and psychosocial support for patients.

Keywords: Pulmonary fibrosis, Oxygen saturation, Smoking, Chronic lung disease.

الملخص
يُعد التليف الرئوي من الأمراض التنفسية المزمنة المتقدمة التي تؤثر على مرونة الرئة وكفاءة تبادل الأكسجين، ويؤدي تدريجيًا إلى قصور تنفسي يؤثر بعمق على جودة حياة المريض. هدفت هذه الدراسة إلى تحليل الخصائص الديموغرافية والفسيولوجية لمرضى التليف الرئوي، وتحديد العوامل المؤثرة مثل التدخين، التاريخ الوراثي، المهنة، والأمراض المصاحبة، مع تقييم تأثير المرض على الأنشطة اليومية وجودة الحياة. شملت العينة 70 مريضًا، وتم جمع البيانات باستخدام استبيان شامل وتحليلها إحصائيًا. أظهرت النتائج أن أغلب المصابين من الذكور، ومن الفئات العمرية المتقدمة (60–79 عامًا)، وبلغ متوسط تشبع الأكسجين في الدم 59.16%، وهو أقل بكثير من المعدل الطبيعي. كما تبين وجود ارتباط واضح بين المرض والتدخين، والتعرض المهني لمواد محفزة للتليف. أشارت النتائج إلى أن النشاط البدني والعمل هما أكثر الجوانب تأثرًا في حياة المرضى اليومية. توصي الدراسة بأهمية برامج الكشف المبكر، والتوعية بمخاطر التدخين والتعرض المهني، وتحسين فرص العلاج والدعم النفسي والاجتماعي للمصابين.

الكلمات المفتاحية: التليف الرئوي، تشبع الأكسجين، التدخين، أمراض الرئة المزمنة.

Introduction:

Including the telephone, anyone with a more serious and life-threatening health condition. This disease is characterized by the growth of progressive scar tissue within the lungs, resulting in organoid structures, diminished alveolar function, and impaired gas exchange between air and blood. This leads to limited, limited capacity, and negatively impacts quality of life (Raghu et al., 2011). Despite scientific advances, idiopathic fibrosis (IPF) still accounts for a significant proportion of cases, with no cure, and no reason to delay its onset

and improve quality of life. Studies indicate a global prevalence rate of IPF between 14 and 43 cases per 100,000 population in industrialized countries (Hutchinson et al., 2015), with high rates reaching over 50% within five years of diagnosis. Evidence also confirms that various factors, such as smoking, environmental pollution, co-occurrence, exposure to organic and chemical irritants, and aging, make this disease a health and environmental challenge. This study relies on an analysis of telephone data, demographic data, and the identification of confirmatory factors such as workplace, reliable status, smoking, comorbidities such as heart disease, and the type of treatment used, with a focus on the daily presence of the disease in the patient, thus enabling the provision of effective therapeutic and community advice. The importance of studying diverse and social factors through a scientific statistical method lies in understanding disease behavior in the local environment and determining the scope for disease detection and diagnosis.

Materials and Methods

The study was designed as a descriptive-analytical study, aiming to evaluate the clinical and demographic characteristics of pulmonary fibrosis patients, focusing on factors associated with the disease and its impact on quality of life. A sample of 70 patients clinically and radiologically diagnosed with pulmonary fibrosis was selected. Data were collected using a carefully designed questionnaire that included demographic (age, sex, height, weight, occupation) and clinical (SpO_2, medical history, symptoms, and family history) variables.

The study tools also included lung function measurements using forced vital capacity (FVC) and inspiratory capacity (IC), which were obtained using spirometers approved for clinical laboratories (Gibson et al., 2005). Statistical analysis was performed using SPSS version 25, calculating means, standard deviations, and frequency distributions, with t-tests for the nature of the variables (Field, 2013). Ethical standards were adhered to during data collection, as written informed consent was obtained from participants after explaining the study objectives and ensuring confidentiality of information, in line with the guidelines of the World Medical Association (World Medical Association, 2013).

Results

Data were collected from a diverse sample that included a number of demographic and physiological variables, including: gender, age, height, weight, and blood oxygen saturation. The following is a detailed presentation of the statistical results and their analysis:

First: Gender: The mean for the gender variable was (1.40), indicating that the sample was equally distributed between males and females, with a relative predominance of males. The standard deviation was low (0.493), indicating a relatively balanced distribution of the sample between the sexes and enhancing the validity of generalizations across both genders.

Second: Age: The age ranged from 7 to 90 years, with a mean of 60.56 years, indicating that the sample included individuals from various age groups, with a focus on the elderly. The high standard deviation (17.42) indicates significant age variation, which is useful for analyzing the effect of age on physiological variables. However, it may require classifying ages into groups (e.g., children, adults, elderly) to accurately interpret the results. Third: Height: The average height was 165.14 cm, which is within the normal range for adult height. However, the lower limit (110 cm) may indicate the presence of children or individuals with short stature or growth disorders. The standard deviation (10.90) indicates moderate variability in this variable.

Fourth: Weight: Weight ranged from 18 kg to 149 kg, with a mean of 72.91 kg. These results reflect a clear variability in body mass index (BMI) and indicate the presence of various conditions within the sample, including underweight, normal weight, overweight, or obesity. The large variability (SD = 16.77) supports this conclusion.

Fifth: Blood oxygen saturation (SpO_2): The average oxygen saturation rate was 59.16%, which is significantly lower than the normal range of 95% to 100%. This result suggests the possibility of serious health problems in the sample, such as chronic lung disease, anemia, or hypoxia. The significant variability (SD = 9.776) and low minimum (31%) reinforce the need to verify the health status of the sample and interpret it in light of their disease or environmental backgrounds**.**

Table 1 presents the demographic characteristics of patients with pulmonary fibrosis.

Statistics					
	Gender	**age**	**length**	**weight**	**Oxygen rate**
Mean	1.40	60.56	165.14	72.91	59.16
Std. Error of Mean	.0590	2.082	1.303	2.005	1.177
Std. Deviation	.4930	17.422	10.904	16.772	9.776
Minimum	1	7	110	18	31
Maximum	2	90	186	149	80

(Gender) : The mean for gender was 1.40, indicating that the sample included both males and females, with males being more represented. Males represented 60% of the sample compared to 40% of females, suggesting that men are more likely to be affected by pulmonary fibrosis or to be more likely to receive diagnosis and treatment.

Table 2 shows the distribution of the study sample according to gender.

	Distribution of the study sample by gender	
percentage%	Repetitions	Gender
60%	42	Males
40%	28	Females
100%	70	Total

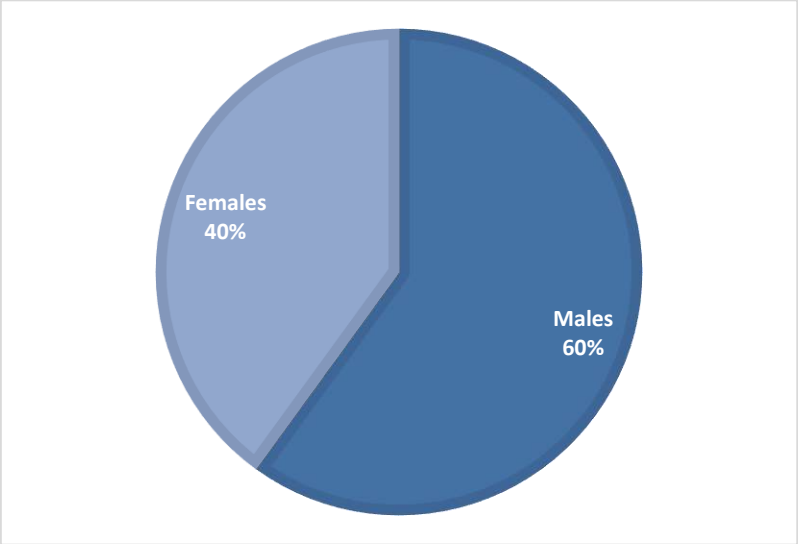

Figure 1 shows the distribution of the study sample according to gender.

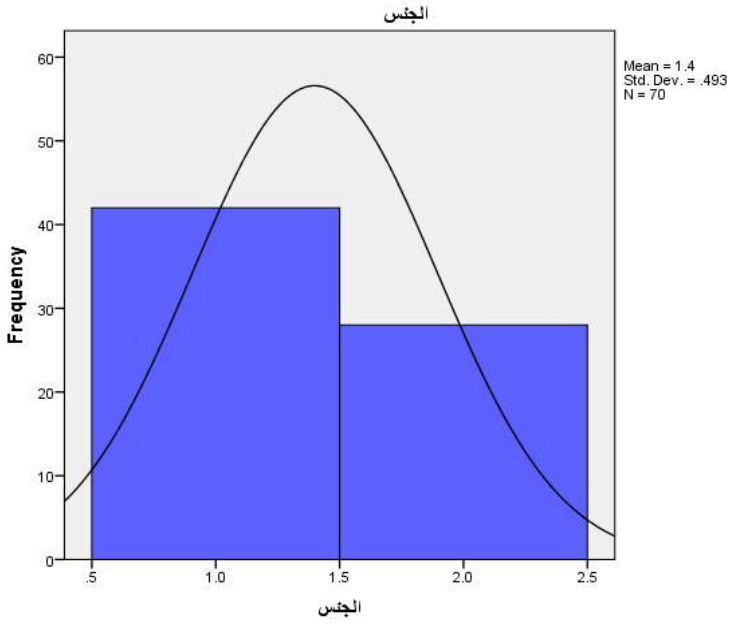

Figure 2 shows gender averages in the study sample**.**

(Age): The results showed a mean age of 60.56 years with a wide range (7–90 years), indicating the sample's comprehensiveness. Advanced age is often associated with decreased functional efficiency of body organs, including the respiratory system, which may explain the lower oxygen saturation in the sample. The largest age group was 60–79 years (44.2%), supporting the idea that pulmonary fibrosis often develops at an older age, in line with studies that link advanced age to an increased risk of chronic lung disease (Raghu et al., 2011).

Table 3 shows the distribution of the sample according to age group.

percentage%	Repetitions	Categories Age
4.2%	3	29 <
11.5%	8	30-49
24.2%	17	69-50
44.2%	31	79-60
11.5%	8	99-80

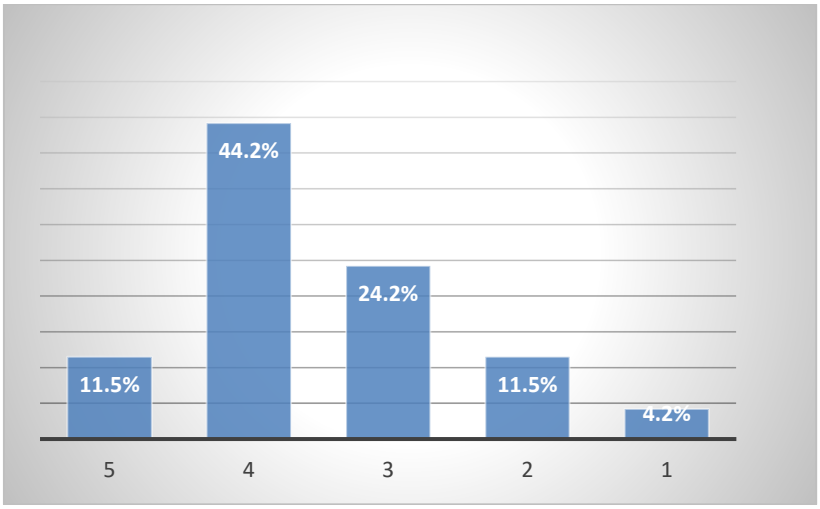

Figure 3 illustrates the distribution of the study samples by age.

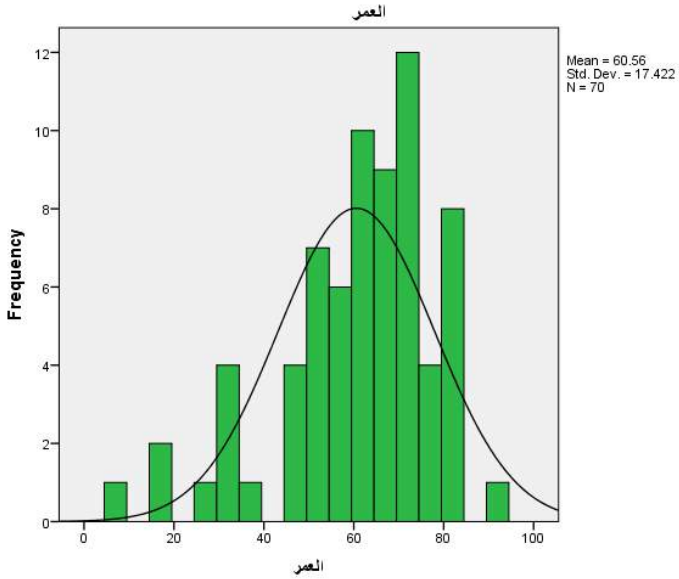

Figure 4 illustrates the variation in age among the study sample.

(Height & Weight Height and weight show averages within the normal range, with considerable variability, reflecting variations in body mass index (BMI). Being overweight or obese can affect the efficiency of the respiratory system, as excess fat reduces the elasticity of the diaphragm and may affect oxygen saturation.
(7) shows the difference in weight.

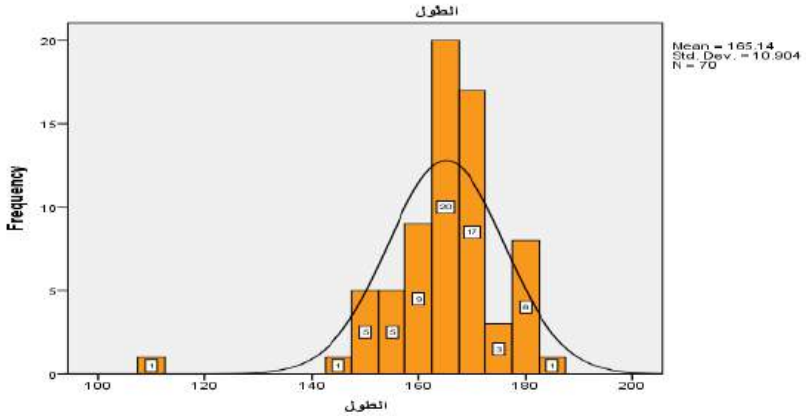

Figure 5 shows the difference in height according to the study sample.

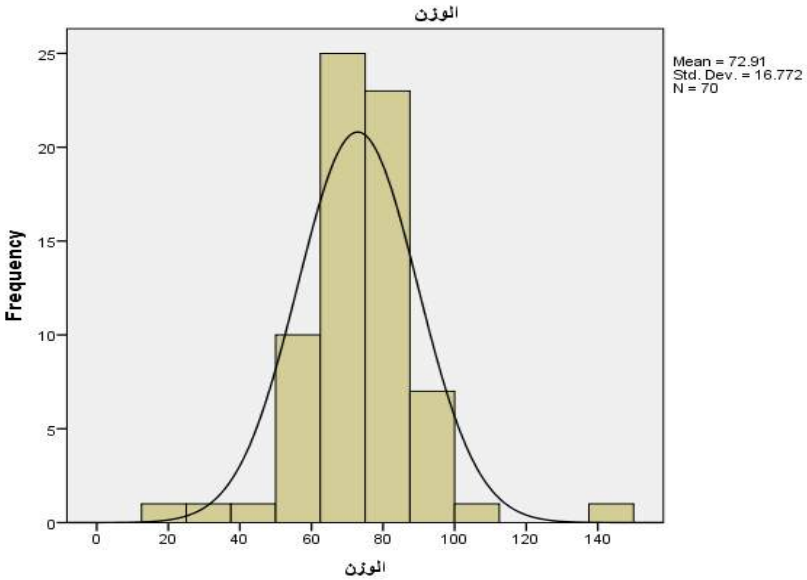

Figure 6 shows the difference in weight according to the study sample.

Lung capacity : The clear difference between the lung capacity of patients (2.8±1.6 liters) compared to healthy controls (4.6±3.1 liters) confirms the severe impact of pulmonary fibrosis on lung function. We also note a significant decrease in the basic capacity and inspiratory capacity of patients, which is expected as a result of fibrosis, which reduces lung elasticity and hinders its expansion (Wells et al., 2003)

Table 4 shows the lung capacity of healthy and sick individuals.

Mean values and standard error (liters) for people with pulmonary fibrosis	**Mean values and standard error (liters) for healthy individuals**	**السعة**
2.8±1.6	4.6±3.1	Baseline capacity
2.1±1.5	3.8±2.4	Inspiratory capacity
1.3±0.5	2.2±1.8	Functional residual capacity

Location of injury
cases (82.8%) were bilateral, indicating severe and widespread fibrosis, increasing the likelihood of respiratory failure and hypoxia.

Table 5 shows the distribution of infection sites in the study sample.

%percentage	Repetitions	Location of injury
8.6%	6	right lung
8.6%	6	left lung
82.8%	58	both of them

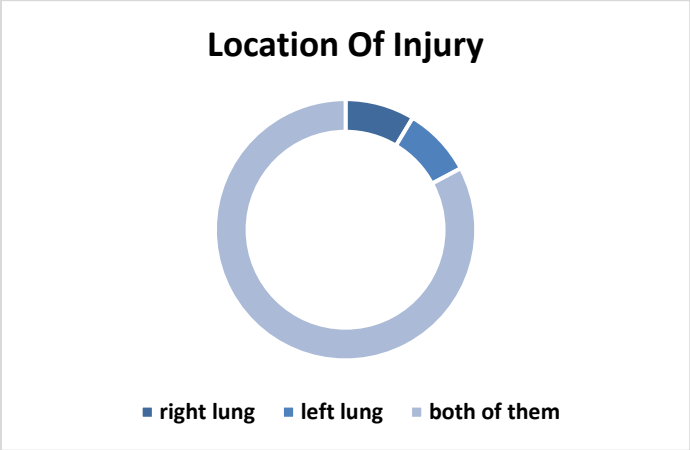

Figure 7 shows the distribution of infection sites in the study sample.

4Genetic factors and smoking: We note that 24.3% of cases have a family history, supporting the possibility of a genetic contribution to the development of the disease (Garcia-Sancho et al., 2011). Although 70% of the sample were "ex-smokers," the percentage of those who quit after diagnosis was low (12.8%), indicating the need to enhance education about the dangers of smoking even after diagnosis.

Table 6 illustrates the genetic factor in the disease.

percentage%	Repetitions	Family history (genetic(
24.3%	17	Yes
75.8%	53	No

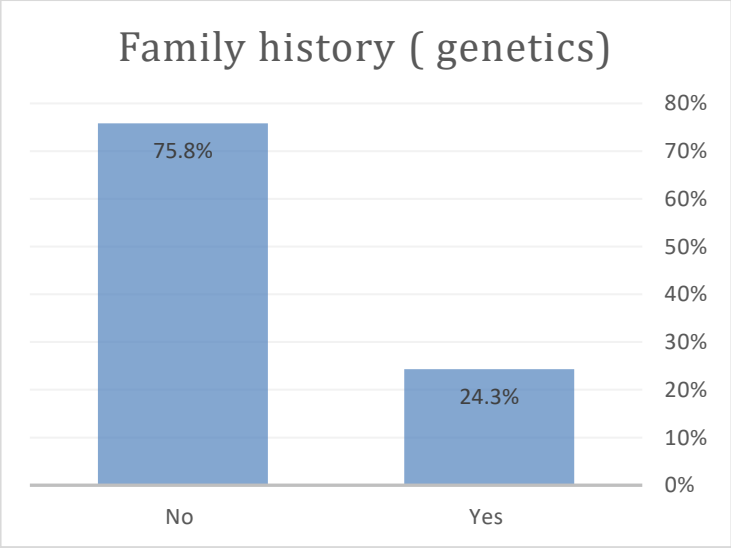

Figure 8 shows the genetic factor in infection.

The relationship between smoking and pulmonary fibrosis: The results reflect a strong association between smoking and pulmonary fibrosis, with 70% of the sample being former smokers, and 30% currently smoking. This clearly indicates that smoking is one of the most important risk factors contributing to the development of pulmonary fibrosis, as confirmed by numerous studies that have linked chronic smoke inhalation to lung tissue damage and the development of fibrosis (Raghu et al., 2011). It is noteworthy that only 14.2% of those who quit smoking before diagnosis was found, while the percentage of those who quit after diagnosis was low (12.8%). This reflects poor health awareness about the risks of smoking or a deficiency in post-diagnosis education programs. This may be due to delayed onset of symptoms or the lack of a direct link between smoking and the onset of respiratory symptoms.

Table 7 shows the relationship between smoking and pulmonary fibrosis.

percentage%	Repetitions	Smoking
30.0%	21	Currently smoking
70.0%	49	ex-smoker
14.2%	40	Quit before you get hurt
12.8%	9	Take off after injury

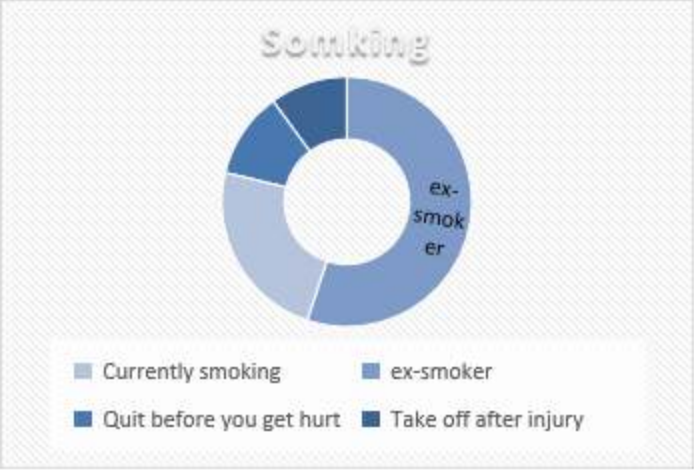

Figure 9 shows the relationship between smoking and pulmonary fibrosis.

Heart disease: The results indicate that approximately 53% of the sample (37 out of a total of 70 hypothesized recurrences) suffered from some form of heart disease. The distribution of cases was as follows: Cardiomyopathies represented 12.8% of the sample, and included conditions such as heart muscle weakness resulting from aging, infections, or genetic factors. Arterial disease (such as coronary artery disease - CAD) also represented 12.8%, and is typically associated with high blood pressure, cholesterol, and obesity. The "other" category accounted for the largest proportion (27.2%), and likely included conditions as diverse as valve disorders, arrhythmias, or congenital defects.

Table 8 shows the relationship between the study sample and heart diseases.

percentage%	Repetitions	Heart Disease
12.8%	9	Heart Muscles
12.8%	9	Arteries
27.2%	19	Other

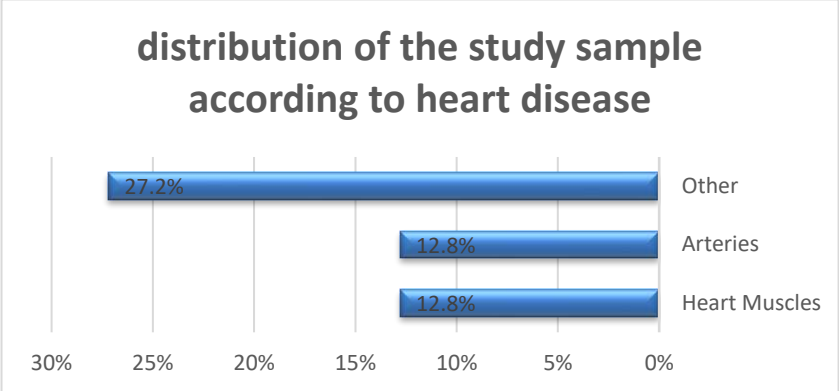

Figure 10 shows the distribution of the study sample according to heart disease.

Workplaces: The highest incidence was in birdkeeping (26 cases (37.1%)), indicating chronic exposure to bird proteins, which increases the risk of developing bird fancier's lung, a chronic allergic disease that can cause low oxygen saturation. The lowest incidence was in mining (4 cases (5.7%). Despite their small number, miners are susceptible to severe diseases such as silicosis resulting from inhaling silica dust, which can lead to chronic respiratory failure. Another high percentage that deserves attention is exposure to volatile substances (15) cases (21.5%), associated with inhalation of chemical fumes that may cause chronic lung diseases, heart disorders and nervous system disorders. Cotton/wool/iron factories (10) cases (14.2%). Workers are exposed to occupational diseases such as byssinosis associated with fiber dust. Unknown causes 19 cases (27.2%), representing a knowledge gap and a challenge in linking occupation to health status.

Table 9 shows the study sample according to the workplace.

percentage%	Repetitions	workplace
37.1%	26	Bird farming
21.5%	15	Volatile materials
14.2%	10	Cotton, wool, or iron factories
5.7%	4	Mines
27.2%	19	Unknown causes

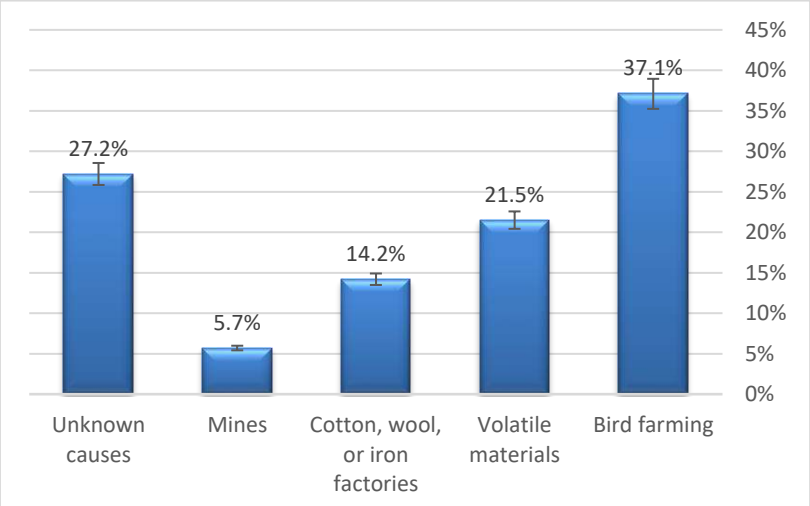

Figure 11 shows the distribution of the study sample according to the workplace.

Type of treatment: The majority of patients (77.1%) received drug therapy, followed by oxygen therapy (58.5%), while none of the patients underwent lung transplantation, which may reflect either a lack of awareness or weak health system capabilities.

Table 10 shows the study sample according to the type of treatment.

percentage%	Repetitions	Type of treatment
77.1%	54	Medications
58.5%	41	Oxygen therapy
7.1%	5	Physiotherapy
0.0%	0	Lung transplantation

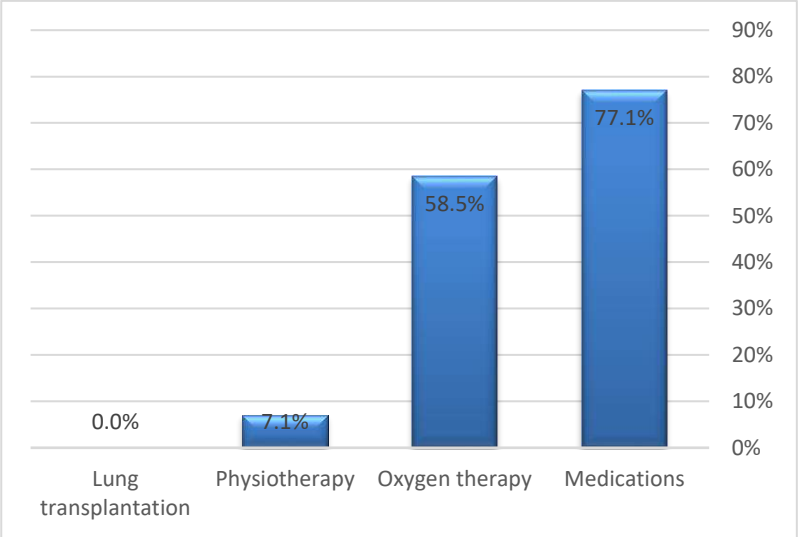

Figure 12 Distribution of the study sample according to the type of treatment.

Quality of life and impacts: 45.7% reported that the disease significantly impacted their quality of life, and 74.2% reported that their physical activity was impaired, which is consistent with the debilitating nature of the disease, especially in its advanced stages.

Table 11 shows the effect of pulmonary fibrosis on the quality of life of the sample members.

percentage%	Repetitions	Impact on quality of life
20.0%	14	Minor impact
34.3%	24	Moderate impact
45.7%	32	Major impact

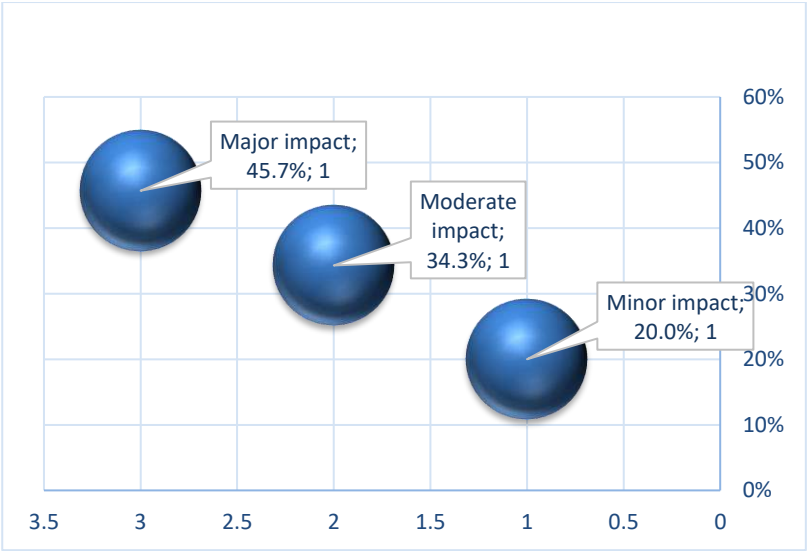

Figure 13 shows the effect of pulmonary fibrosis on the quality of life of the sample members.

Common symptoms: The most common symptoms were shortness of breath (78.5%), fatigue (68.5%), and chest pain (65.7%). These are classic clinical signs of pulmonary fibrosis, especially with the decreased ability to exchange oxygen.

Table 12 shows the distribution of the study sample according to symptoms.

percentage%	Repetitions	Symptoms
78.5%	55	Shortness of breath
65.7%	46	Chest pain
52.9%	37	Curved nails
68.5%	48	Fatigue
57.1%	40	Unexplained weight loss
60.0%	42	Pale or pale face

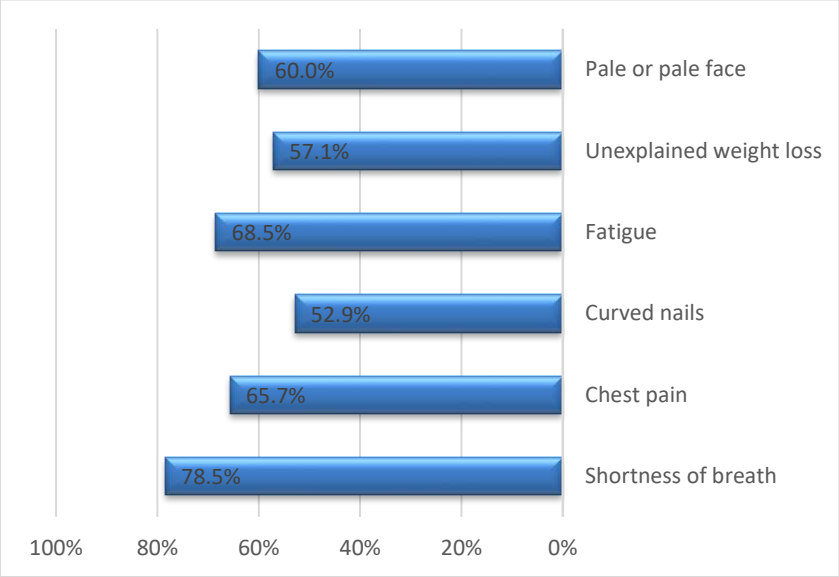

Figure 14 shows the distribution of the sample according to symptoms.

The impact of pulmonary fibrosis on the daily lives of those affected :The results indicate that pulmonary fibrosis significantly impacts the daily quality of life of patients. Physical activity was the most affected aspect, accounting for 74.2% of the total. This is expected given that the disease causes difficulty breathing and a reduced ability to exert physical effort due to reduced lung efficiency. This is consistent with previous studies indicating that pulmonary fibrosis causes shortness of breath with minimal exertion, limiting patients' ability to perform normal daily activities (Swigris et al., 2005). Work capacity was also affected for 38.5% of the sample, reflecting the economic and social impact of the disease, particularly among productive segments of society. Social relationships (11.5%) and education (1.5%) were less affected, which may be explained by the fact that the disease often affects the elderly or retired, limiting their participation primarily in study or intensive social activities, compared to the direct impact on physical activity and work.

Discussion

The study results showed that the majority of participants were male, potentially reflecting their higher exposure to environmental or occupational risk factors associated with pulmonary fibrosis, such as smoking or exposure to workplace dust pollutants. This is consistent with Meltzer and Noble (2008) who reported that males constitute a higher proportion of those with pulmonary fibrosis, and this is related to environmental and behavioral exposure patterns. Pulmonary fibrosis was also found to be more common in older age groups, with the mean age of the sample ranging from 60–79 years, demonstrating the association of aging with a decreased ability of lung tissue to repair. This is supported by the clinical recommendations set by the American Thoracic Society, which state that pulmonary fibrosis tends to appear most often in the sixth decade of life (Raghu et al., 2011). Oxygen saturation levels were significantly reduced in most patients, in some cases falling below 60%, indicating significant impairment of gas exchange due to pulmonary fibrosis. This finding supports the study by Wells et al. (2003), which demonstrated that pulmonary fibrosis directly affects lung capacity and the lung's

ability to expand, limiting the effectiveness of deep breathing and leading to hypoxia. Regarding medical history, the results showed that a number of sample members had a family history of the disease, supporting the hypothesis of a genetic predisposition, especially in cases of familial fibrosis associated with a mutation in the telomerase gene, as indicated by the study by Garcia-Sancho et al. (2011). Furthermore, a high percentage of participants were current or former smokers, reinforcing what has been established in the medical literature that smoking is one of the most important factors predisposing to the development of pulmonary fibrosis, given its cumulative effect on lung tissue and the resulting chronic inflammation that may lead to fibrosis (Raghu et al., 2011). Regarding occupational factors, it was found that a large number of patients worked in occupations associated with direct exposure to lung irritants such as cotton dust, bird proteins, and volatile chemicals. These environments have been linked to chronic lung diseases such as silicosis and avian breeder's disease (American Lung Association, 2021). Functional effects were clearly evident, with total lung capacity, inspiratory capacity, and functional residual capacity significantly reduced in patients compared to healthy controls. This is supported by the findings of Wells et al. (2003), who indicated that decreased respiratory parameters are one of the hallmarks of fibrosis. The study also showed that pulmonary fibrosis has a significant negative impact on quality of life, particularly physical activity and work. This finding is confirmed by Swigris et al. (2005), who linked disease progression to decreased functional performance and quality of daily life. This impact was reflected in limitations in daily and functional activities, including social relationships and the ability to learn or work.

Conclusion

The study results indicate that pulmonary fibrosis is a chronic disease that causes significant deterioration in respiratory function and is associated with multiple factors, including aging, smoking, genetic predisposition, and occupational environment. Low oxygen saturation in patients is a sign of chronic respiratory failure, which has physical and functional consequences. The data demonstrate that the disease negatively impacts physical and work performance, affecting patients' quality of life. Despite the availability of drug treatments and oxygen, advanced treatment options are underutilized, calling for greater attention to the level of healthcare directed at this group.

Recommendations

The study recommends intensifying health awareness about the dangers of smoking and the need to quit, especially among groups at risk of developing pulmonary fibrosis. It is also recommended to regularly monitor workers in hazardous occupations and conduct regular respiratory examinations for them. It is also essential to provide psychological and social support to patients to improve their ability to cope with the disease. Finally, health care capabilities related to early diagnosis and the provision of advanced treatment options such as lung transplantation should be strengthened, in addition to encouraging scientific research to better understand the genetic and environmental aspects of the disease.

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