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Epidemiological Profile and Clinical Characteristics of Diagnosed Silicosis Patients Admitted at TB & Chest Hospital, Badi, R.N.T. Medical College, Udaipur, Rajasthan

Dr. Kunal Parmar[1*], Dr.Suraj Prakash Sharma[1], Dr. Dinesh Chandra Dhaker[1], Dr. Mahendra Kumar Bainara[2] , Dr. Ankit Bhagora[3]

[1] Junior Resident, Department of Respiratory Medicine, RNT Medical College, Udaipur (Raj.)

[2] Senior Professor, Department of Respiratory Medicine, SMS Medical College, Jaipur (Raj.)

[3] Assistant Professor, Department of Community Medicine, Govt. Medical College, Dungarpur (Raj.)

***Corresponding Author**

Dr. Kunal Parmar,
Junior Resident
Department of Respiratory Medicine, RNT medical College,
Udaipur (Raj.)
Mobile number: 9782170105
E mail- kunuparwar88@gmail.com

Abstract:

This cross-sectional analysis examines the epidemiological profile and clinical characteristics of diagnosed silicosis patients admitted at TB & Chest Hospital, Badi, affiliated with R.N.T. Medical College in Udaipur, Rajasthan. The study analyzes a total of 63 cases, investigating the distribution of cases by age, occupation, history of tuberculosis (TB), smoking history, symptoms, duration of illness, and type of cases. The findings provide valuable insights into the demographic and clinical aspects of silicosis in the region, facilitating a better understanding of this occupational lung disease and informing preventive and management strategies.

INTRODUCTION

Silicosis, a chronic occupational lung disease caused by the inhalation of crystalline silica dust, remains a significant global health concern, particularly in developing countries with high-risk industries such as mining, quarrying, and construction (1, 4). The rise in silicosis cases necessitates a thorough understanding of its epidemiology and clinical manifestations to effectively address this occupational hazard (8, 12).

In India, silicosis has emerged as a growing public health issue, with several regions, including Rajasthan, bearing a heavy burden of the disease (12). Rajasthan, located in northwestern India, stands out due to its stone-related industries and the high levels of silica dust exposure faced by workers (5). Within Rajasthan, Udaipur has become a focal point for silicosis cases, given its concentration of stone-cutting and mining activities (5).

Despite the significance of silicosis in Udaipur, there has been limited research specifically focused on the characteristics of diagnosed silicosis cases admitted at TB & Chest Hospital in

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Udaipur, Rajasthan. A comprehensive understanding of various factors such as age, occupation, history of tuberculosis (TB), smoking history, symptoms, duration of illness, and case types among diagnosed silicosis patients is vital for the development of targeted prevention strategies and improved management protocols (1, 3, 6).

Therefore, this cross-sectional study aims to address this research gap by analyzing the distribution and characteristics of diagnosed silicosis cases at TB & Chest Hospital in Udaipur, Rajasthan. By examining these factors, the study seeks to contribute to the formulation of effective prevention strategies and enhanced management approaches for silicosis in the region (2, 7).

Aim and Objectives of Study

The aim of this study is to investigate the distribution and characteristics of diagnosed silicosis cases at TB & Chest Hospital in Udaipur, Rajasthan, India.

The specific objectives of the study are as follows:

1. To determine the demographic profile of diagnosed silicosis cases, including age, gender, and occupation.
2. To assess the occupational history and duration of exposure to crystalline silica among the diagnosed silicosis cases.
3. To analyze the clinical manifestations and symptoms reported by the diagnosed silicosis cases.
4. To investigate the relationship between smoking history and the development of silicosis among the diagnosed cases.

Materials and Methods:

Study Area: The study was conducted at TB & Chest Hospital Badi, a 260-bed teaching hospital located in Udaipur, Rajasthan, India. The hospital operates under the Department of Respiratory Medicine, R.N.T MEDICAL COLLEGE.

Study Period: The study was conducted over a period of one year, from January 2022 to December 2022.

Study Design: A hospital-based cross-sectional study design was employed. Sample Size: A total of 63 patients were included in the study after applying specific inclusion and exclusion criteria.

Study Population: The study population consisted of patients selected from the Outpatient Department (OPD) and Inpatient Department (IPD) of TB & Chest Hospital, Badi, under the Department of Respiratory Medicine, R.N.T MEDICAL COLLEGE, Udaipur, Rajasthan. Informed consent was obtained from the participants, and inclusion and exclusion criteria were applied.

Study Method: Patients were selected based on the predefined inclusion and exclusion criteria. This observational study included 63 patients diagnosed with silicosis based on clinical evaluation and radiological evidence. The patients were admitted to TB & Chest Hospital, Badi, Udaipur. A detailed occupational history was obtained, including the nature of occupation, duration of exposure, use of protective measures, and other associated risk

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factors related to working in silica mines. The selected patients underwent routine chest X-ray (CXR) and sputum examination for acid-fast bacilli (AFB) using the Ziehl-Neelsen (ZN) staining technique. Sputum samples were also tested using the Cartridge-Based Nucleic Acid Amplification Test (CBNAAT) to detect drug resistance. CXR images were evaluated for bilateral nodular or reticulonodular patterns, cavitation, pneumothorax, and high-resolution computed tomography (HRCT) findings indicative of silicosis, such as bilateral nodular opacities, bilateral mediastinal lymphadenopathy, and progressive massive fibrosis (PMF).

Inclusion Criteria:

1. Patients diagnosed with silicotuberculosis who provided informed consent to participate in the study.
2. Patients diagnosed with silicotuberculosis with a significant duration of exposure in different types of occupations, such as stone cutting, crushing, designing, and shining industries.

Exclusion Criteria:

1. Patients who were unwilling to provide consent for the study.
2. Patients with massive hemoptysis.
3. Uncooperative patients.

The above materials and methods were employed to collect data and investigate the prevalence and characteristics of silicosis among the selected patient population. The study design and procedures ensured adherence to ethical considerations and aimed to gather valuable insights into the occupational health burden associated with silica exposure in the study area.

Result

The distribution of diagnosed Silicosis cases according to age. A total of 63 cases were analyzed in this study. The cases were categorized into different age groups, namely 21-30, 31-40, 41-50, and 51-60 years.

In the 21-30 age group, there were 16 cases, which accounted for 25.4% of the total cases. The 31-40 age group had 26 cases, representing 41.3% of the total. The 41-50 age group had 19 cases, accounting for 30.1%. The 51-60 age group had the lowest number of cases, with only 2, representing 3.2% of the total.

The mean age of the diagnosed Silicosis patients was calculated to be 40.16 years, with a standard deviation of 8.10 years. This indicates that the average age of the patients in this study was around 40 years. The standard deviation of 8.10 suggests that the ages of the patients were relatively spread out around the mean.

From this study, it can be inferred that the majority of diagnosed Silicosis cases occurred in individuals aged between 31 and 50 years. These age groups accounted for approximately 71.4% of the total cases. The age group of 21-30 years had a considerable number of cases as well. On the other hand, individuals aged 51-60 years had the fewest cases of Silicosis.

Among the diagnosed Silicosis cases, 60 were male, accounting for 95.3% of the total cases. On the other hand, there were only 3 female cases, representing 4.7% of the total.

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To determine if there was a statistically significant difference in the distribution of Silicosis cases between males and females, a p-value of 0.93 was calculated. The p-value represents the probability of obtaining results as extreme as the observed ones, assuming there is no difference between males and females in terms of Silicosis incidence.

In this case, a p-value of 0.93 suggests that there is no significant difference in the distribution of Silicosis cases between males and females. This means that the proportion of diagnosed Silicosis cases among males is similar to the proportion among females. The high p-value indicates that any observed differences in the number of cases between males and females could likely be due to random chance rather than an actual gender-related difference in Silicosis incidence.

It is important to note that while the percentage of diagnosed Silicosis cases among females is relatively small (4.7%), it does not necessarily indicate a lower susceptibility to Silicosis in females. Other factors, such as occupational exposure, lifestyle, or access to healthcare, may contribute to the observed gender distribution of Silicosis cases.

TABLE 1. DISTRIBUTION OF CASES ACCORDING TO OCCUPATION

OCCUPATION	NUMBER	PERCENTAGE
DRILL MACHINE OPERATOR	1	1.6
STONE CUTTING	43	68.3
STONE DESIGNING	6	9.5
STONE DRILLING	13	20.6

Table 1 shows the majority of diagnosed Silicosis cases in this study were attributed to stone cutting, accounting for 68.3% of the total cases. Stone drilling and stone designing contributed to 20.6% and 9.5% of the cases, respectively, while the occupation of drill machine operator had the lowest number of cases with 1.6%.

TABLE 2. DISTRIBUTION OF CASES ACCORDING TO H/O TB, H/O ATT &MDR TB

PARAMETERS	H/O TB		H/O ATT		MDR TB	
	Number	%	Number		Number	%
PRESENT	31	49.2	31	56.8	2	3.2

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ABSENT	32	56.8	32	49.2	61	96.82
TOTAL	63	100	63	100	63	100

The table 2 indicates that approximately 49.2% of diagnosed silicosis cases had a history of tuberculosis (TB), while 56.8% had a history of anti-tuberculosis treatment (ATT). Only 3.2% of the cases were identified as multidrug-resistant tuberculosis (MDR TB). However, the p-value of 0.073 suggests a marginal level of significance.

TABLE 3. DISTRIBUTION OF CASES ACCORDING TO H/O SMOKING (PACK YEARS)

PARAMETERS	PACK YEARS	NUMBER	PERCENTAGE
SMOKER	5-10	8	12.6
	11-20	25	39.7
	21-30	12	19
	>30	1	1.5
TOTAL		46	
NON SMOKER	0	17	0

MEAN PACK PER YAER – 18.7±15.9

P VALUE -0.002

Table 3 presents the distribution of silicosis cases based on the history of smoking (pack years). Among the smokers, 39.7% had a pack year range of 11-20, followed by 19% with a range of 21-30. Only 1.5% had a pack year greater than 30. The p-value of 0.002 indicates a statistically significant association between smoking history and diagnosed cases.

TABLE 4. DISTRIBUTION OF CASES ACCORDING TO SYMPTOMS

SYMPTOMS	PRESENT (PERCENTAGE)	ABSENT (PERCENTAGE)	TOTAL (PERCENTAGE)
CHEST PAIN	60(95.2)	3(4.8)	63(100)
DYSPNOEA	63(100)	0(0)	63(100)
COUGH	63(100)	0(0)	63100)
HAEMOPTYSIS	15(23.8)	48(76.2)	63(100)

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FEVER	56(88.9)	7(11.1)	63(100)
WEIGHT LOSS	33(52.3)	30(47.7)	63

The table 4 shows the distribution of cases of silicosis based on the presence or absence of symptoms. Among the diagnosed cases, chest pain was present in 95.2%, dyspnea in 100%, cough in 100%, hemoptysis in 23.8%, fever in 88.9%, and weight loss in 52.3%. The absence of symptoms was observed in a small percentage of cases for each symptom. These findings suggest that symptoms such as chest pain, dyspnea, cough, fever, and weight loss are commonly associated with silicosis.

TABLE 5. DISTRIBUTION OF CASES ACCORDING TO TOTAL DURATION OF ILLNESS

TOTAL DURATION OF ILLNESS(YEARS)	NUMBER	PERCENTAGE
<5	30	47.6
6-10	23	36.5
11-15	8	12.7
16-20	2	3.2
TOTAL	63	100

Table 5 presents the distribution of silicosis cases based on the total duration of illness in years. Among the cases, 47.6% had an illness duration of less than 5 years, followed by 36.5% with a duration of 6-10 years. Only a small proportion of cases had an illness duration of 11-15 years (12.7%) or 16-20 years (3.2%). These findings indicate that a significant number of silicosis cases are diagnosed within the first 10 years of illness.

TABLE 6. DISTRIBUTION OF CASES ACCORDING TO TYPE OF CASES

TYPES OF CASES	NUMBER	PERCENTAGE
DSTB	60	95.2
DRTB	3	4.8
TOTAL	63	100

Table 6 illustrates the distribution of silicosis cases based on the type of cases. Among the cases, 95.2% were classified as drug-susceptible tuberculosis (DSTB), while 4.8% were classified as

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drug-resistant tuberculosis (DRTB). These findings suggest that the majority of silicosis cases are associated with drug-susceptible tuberculosis.

DISCUSSION

The study analyzed a total of 63 diagnosed cases of Silicosis, providing valuable insights into the epidemiological characteristics of the disease. The findings reveal important patterns in age distribution, gender distribution, occupation, tuberculosis history, smoking history, symptoms, illness duration, and drug susceptibility.

Age Distribution: The highest number of Silicosis cases was found in the 31-40 age group (41.3%), followed by the 41-50 age group (30.1%). This observation aligns with previous studies, such as the analysis by Wang, Zhang (2018), which also reported a peak in Silicosis cases in the 31-40 age group. These findings suggest that individuals in their 30s and 40s are particularly susceptible to Silicosis(6).

Gender Distribution: The majority of diagnosed Silicosis cases were male (95.3%), while only a small percentage were female (4.7%). This gender disparity is consistent with the general occupational distribution of silica-exposed jobs, which are often male-dominated. The World Health Organization publication by Greenberg, Waksman, and Curtis (2007) provides further insights into the occupational aspects and gender distribution of Silicosis cases(9).

Occupation: The study found that stone cutting accounted for the highest number of Silicosis cases (68.3%), followed by stone drilling (20.6%), stone designing (9.5%), and drill machine operation (1.6%). These findings are consistent with the occupational exposure patterns associated with Silicosis. The references by Leung, Yu, and Chen (2012) and Steenland and Ward (2014) provide extensive information on various occupations with high silica exposure and their association with Silicosis.

Tuberculosis History: Approximately 49.2% of diagnosed Silicosis cases had a history of tuberculosis (TB), while 56.8% had a history of anti-tuberculosis treatment (ATT). These findings highlight the coexistence of Silicosis and tuberculosis, emphasizing the need for comprehensive management strategies. The references by Leung, Yu, and Chen (2012) and Greenberg, Waksman, and Curtis (2007) discuss the association between Silicosis and tuberculosis and provide insights into the challenges faced in treating coexisting respiratory conditions.

Smoking History: The study found a statistically significant association between smoking history (pack years) and diagnosed Silicosis cases (p-value = 0.002). The majority of smokers had a pack year range of 11-20 (39.7%). These findings underline the synergistic effects of smoking and silica exposure on the risk of developing Silicosis. The references by Greenberg, Waksman, and Curtis (2007) and Steenland and Ward (2014) discuss the combined impact of smoking and silica exposure on respiratory health.

Symptoms: Common symptoms associated with Silicosis included chest pain (95.2%), dyspnea (100%), cough (100%), hemoptysis (23.8%), fever (88.9%), and weight loss (52.3%). These symptoms align with the typical clinical presentation of Silicosis. The review by Leung, Yu, and

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Chen (2012) provides comprehensive insights into the clinical features and symptoms of Silicosis(8).

Illness Duration: The duration of illness varied among the cases, with 47.6% having an illness duration of less than 5 years and 36.5% having a duration of 6-10 years. These findings highlight the chronic nature of Silicosis and its long-term impact on affected individuals. The reference by Gupta (1999) and Jindal (2013) offer historical context and further understanding of the duration and progression of Silicosis(12).

Drug Susceptibility: The majority of Silicosis cases were classified as drug-susceptible tuberculosis (DSTB, 95.2%), while a small percentage were classified as drug-resistant tuberculosis (DRTB, 4.8%). These findings emphasize the importance of differentiating drug susceptibility patterns in Silicosis cases for appropriate treatment. The review by Leung, Yu, and Chen (2012) discusses the management and treatment options for Silicosis and tuberculosis(8).

Conclusion

The study conducted at TB & Chest Hospital, Badi, revealed a significant prevalence of silicosis among the selected patient population. The findings indicated that occupational exposure to silica mines, particularly in industries such as stone cutting, crushing, designing, and shining, was associated with the development of silicosis. The clinical evaluation, radiological evidence, and diagnostic tests confirmed the presence of silicosis in the study participants. These results highlight the urgent need for effective preventive measures, awareness programs, and improved occupational health and safety practices to mitigate the burden of silicosis in the study area and protect the health of workers exposed to silica dust.

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Conflict of interest: None declared.

Ethical Approval: The study was approved by the Institutional Ethics Committee, Rabindra Nath Medical College and attached hospital, Udaipur (Rajasthan).

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