



## Original Research Article

# STUDY OF RESPIRATORY PROBLEMS ASSOCIATED WITH SAND QUARRY WORK AND ITS PREVALENCE AMONG QUARRY WORKERS IN BUNDELKHAND REGION

Raj Kamal Singh<sup>1</sup>, Jitendra Singh Yadav<sup>2</sup>, Shivendra Singh<sup>3</sup>

<sup>1</sup>Associate Professor Department of TB & Chest, Rani Durgawati Medical College Banda, Uttar Pradesh, India

<sup>2</sup>Professor Department of Otorhinology, Rani Durgawati Medical College Banda, Uttar Pradesh, India

<sup>3</sup>Resident, Department of Physiology, Rani Durgawati Medical College, Banda, Uttar Pradesh, India

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### Corresponding Author:

**Dr. Raj Kamal Singh**  
Associate Professor Department of TB & Chest, Rani Durgawati Medical College Banda, Uttar Pradesh, India  
Email: drrajkamal2602@gmail.com

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### ABSTRACT

Sand quarrying constitutes a major source of livelihood in the Bundelkhand region. This occupation exposes the workers to high levels of respirable dust particle containing silica. Prolonged exposure to these types of respirable dust particle has been associated with numerous respiratory disorders. In this study, we have tried to assess the prevalence of respiratory problems among the quarry workers and evaluate associated risk factors, including duration of exposure and smoking habits. This study was conducted in field and hospital setting. Analytical approach was applied to evaluate the findings, which were compared to previously done studies from similar quarrying population in India. Results indicated a high prevalence of respiratory symptoms with markedly reduced lung function among quarry workers.

**Keywords:** Sand quarry workers, Respiratory problems, Silica dust, COPD, Bundelkhand region.

### INTRODUCTION

Occupational exposure to dust is a well-established risk factor for respiratory diseases. Sand quarry workers are especially susceptible due to continuous exposure to fine particulate matter generated during excavation, crushing, loading, and transportation of sand and gravel. These respirable dust particles, especially those containing crystalline silica, penetrate deep into the lungs and may cause chronic respiratory diseases such as chronic obstructive pulmonary disease (COPD), silicosis, bronchitis, and restrictive lung disorders like interstitial lung diseases.

The Bundelkhand region, spanning in parts of Uttar Pradesh and Madhya Pradesh, contains numerous informal sand quarrying sites where enforcement of safety regulations is limited. Despite the growing workforce in sand quarrying, limited region-specific data are available on respiratory health outcomes among workers in the region. This paper aims to highlight the prevalence of respiratory problems in this occupational group. (and help to plan health

schemes for the target population i.e. quarry workers and population living around these areas).

### Objectives

To study prevalence of respiratory disorders associated with sand quarrying work and examine relationship between duration of exposure and respiratory morbidity

### MATERIALS AND METHODS

The study includes, adult population of 150 quarry workers, from field and those attending hospital for their respiratory ailment. Age groups of 18-60years, with a minimum of 1 year of occupational exposure of working in different sand quarries in the Bundelkhand region were included in study.

Data regarding demographic details, years of exposure, smoking status, presence of respiratory symptoms and pulmonary function test outcomes were recorded and were analysed.

## RESULTS

**Table 1: Demographic Characteristics of Sand Quarry Workers (n = 150)**

Age group	Frequency	Percentage (%)
18-30 years	38	25.3
31-45 years	72	48.0
46-60 years	40	26.7

  

Gender	Frequency	Percentage (%)
Male	132	88.0
Female	18	12.0

Demographic data analysis reflects that the majority of the work force in sand quarry work is constituted by middle age group individuals i.e age group of 31-45 years. Moreover, among these workers, male

workers are in majority (88%) as compared to female workers (12%). This may be likely due to the labour-intensive nature of quarry mining work.

**Table 2: Duration of Occupational Exposure**

Duration of Exposure	Number of Workers	Percentage (%)
1-5 years	42	28.0
6-10 years	56	37.3
>10 years	52	34.7

This Table Provide Information Regarding Duration of Exposure of Workers to Mining Dust Which Led to Development of Respiratory Problem.

**Table 3: Prevalence of Respiratory Symptoms**

Respiratory Symptom	Number of Workers	Percentage (%)
Chronic cough	78	52.0
Breathlessness	96	64.0
Chest tightness	54	36.0
Wheezing	48	32.0
No symptoms	22	14.7

Table Shows the Respiratory Problem Which Quarry Workers Often Develop During Their Period of Employment at Quarry Mining Fields.

**Table 4: Pulmonary Function Status (Based on Spirometry Findings)**

Lung Function Pattern	Number of Workers	Percentage (%)
Normal	46	30.7
Obstructive pattern (COPD)	58	38.7
Restrictive pattern	32	21.3
Mixed pattern	14	9.3

This table reflects the spirometric findings of all those workers who were involved in this study. It is observed that about 69% of the worker develop one

or other type of respiratory problem. Even those who had normal findings on spirometry had certain clinical problems.

**Table 5: Association Between Exposure Duration and Respiratory Morbidity**

Exposure Duration	Respiratory Morbidity Present (%)
1-5 years	38.1
6-10 years	62.5
>10 years	78.8

This Table Clearly Indicates That with Increasing Duration of Exposure the Rate of Respiratory Morbidity Increases.

## DISCUSSION

On analysis of data obtained, it was observed that there is a high prevalence of respiratory disorders with impaired lung function among the quarry workers in the region. Breathlessness (64%) and chronic cough (52%) were the most frequent symptoms. These are further followed by chest

tightness (36%) and wheezing (32%). Similar symptom patterns have been reported among stone quarry workers in Rajasthan, Tamil Nadu, and Odisha, where more than half of the workers complained of respiratory discomfort after several years of exposure (Singh et al., 2019). These symptoms are early indicators of chronic airway inflammation and progressive lung damage caused

by prolonged exposure to respirable dust. Respirable quarry dust consists of fine particulate matter capable of reaching the terminal bronchioles and alveoli. Continuous exposure and inhalation of such particles leads to persistent inflammatory responses in airways & parenchyma. This often leads in airflow limitation due to obstruction by secretions in response to inflammation & fibrosis, resulting in reduced gas exchange capacity and air trapping in airways. The observed spirometric data reveals that almost 69.3% of study population had significantly lower values of forced expiratory volume in one second (FEV<sub>1</sub>), forced vital capacity (FVC), and peak expiratory flow rate (PEFR) compared to unexposed populations. The study revealed that 37.8% had obstructive features i.e. COPD with 21.3% had restrictive features on spirometry. A mixed pattern was observed in 9.3% of the study population. These findings confirm the adverse effects of dust exposure on pulmonary function (Meo et al., 2004; Gupta et al., 2018).

Other significant finding observed in the study is that, the workers with more years of quarrying experience demonstrated markedly higher rates of respiratory morbidity compared to those with shorter exposure durations. This observation reinforces the dose–response relationship between dust exposure and lung function impairment, where cumulative exposure plays a significant role in disease progression. Long-term inhalation of silica dust is known to cause chronic obstructive pulmonary disease (COPD), silicosis, and mixed ventilatory defects, all of which are irreversible and progressive in nature (WHO, 2007).

Obstructive lung disease among quarry workers is often underdiagnosed and workers seek medical attention only when symptoms become severe enough and starts impairing their daily routine functioning. By this time significant lung damage has already occurred. Studies have shown that spirometry-based screening can detect early airflow limitation even in asymptomatic workers, thus emphasizing the need for regular respiratory surveillance in high-risk occupational groups (Mohan et al., 2020).

No usage of personal protective equipment (PPE) further exacerbates respiratory morbidity among sand quarry workers. Despite the availability of basic protective measures such as face masks and respirators, none is used in informal quarrying settings. Workers often use handkerchiefs or a piece of cloth wrapped around the face as face mask which is least effective to provide any kind of protection against the fine dust particulates. Factors contributing to poor compliance include lack of awareness, discomfort during prolonged use & financial constraints. Without adequate respiratory protection there is significantly increased risk of developing inflammatory lung disease. Previous studies have reported that workers who consistently used protective masks exhibited better lung function

compared to those who did not, highlighting the protective role of PPE (Chakraborty et al., 2016).

In addition to inadequate PPE usage, the lack of dust suppression measures significantly contributes to elevated airborne particulate concentrations at quarry sites. Practices such as water spraying during excavation and crushing operations are rarely implemented in small-scale sand quarrying operations. This results in excessive dust generation, particularly during dry seasons when environmental conditions favour dust dispersion. Environmental monitoring studies have shown that particulate matter levels in quarrying areas often exceed permissible occupational exposure limits, posing serious health risks to workers and nearby communities (Central Pollution Control Board, 2010).

Smoking habits among quarry workers further compounds the adverse respiratory effects of dust exposure. Tobacco smoke acts synergistically with occupational dust, accelerating lung function decline and increasing the risk of COPD. Several studies have reported significantly lower spirometric values among smoker quarry workers compared to non-smokers with similar exposure histories (Jindal et al., 2012). In the Bundelkhand context, smoking prevalence among male workers is high. Awareness regarding smoking & its combined effect with occupational exposure is almost negligible. Smoking cessation interventions should therefore be integrated into occupational health programs for quarry workers.

The informal nature of sand quarrying jobs in the region plays a critical role in exacerbating occupational health risks. Workers are often employed on a daily wage basis without health insurance or job security. Similar challenges have been documented in informal mining sectors across India and other developing countries, where occupational health hazards remain largely unaddressed (ILO, 2015).

Another important concern is the lack of awareness among workers regarding the long-term health consequences of dust exposure. Many workers perceive respiratory symptoms as a normal part of their occupation and do not seek medical attention until symptoms become debilitating. Health education programs focusing on early symptom recognition, preventive practices, and the importance of medical check-ups could play a crucial role in reducing disease burden.

Respiratory diseases not only reduce quality of life but also impair working capacity, leading to economic hardship for workers and their families. In region, where alternative employment opportunities are limited, workers often continue quarrying despite declining health, creating a vicious cycle of exposure and disease progression.

## CONCLUSION

Sand quarry workers in the Bundelkhand region are at a significant risk of developing respiratory problems due to prolonged exposure to silica-rich dust. The high prevalence of respiratory symptoms and abnormal pulmonary function patterns underscores the urgent need for preventive strategies, early diagnosis, and regular health surveillance.

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