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CRUSHED TO DEATH: HEALTH AND SAFETY RIGHTS OF STONE CRUSHERS IN NORTH BENGAL, INDIA

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Abstract

Silicosis, among the stone crushing laborers, is considered one of the most common fatal occupational health hazards. Various forms of crushed stone play an extremely important role in urbanization. However, a lack of awareness and the degraded working environment often deny the basic right to health and safe working conditions for stone crushers, the backbone of development worldwide. Masonry workers develop this incurable and irreparable disease due to constant inhalation of crystalline silica particles, which are commonly found in most natural and engineered stones worldwide. Over 200 migrant stone crushers in the Balason riverbed in North Bengal, India, were interviewed in 3 years to understand their socio-economic background and health impact caused by the stone crushing job. It was observed that there are usually two types of crushing methods involved to produce the required sizes of stone chips as per the industry demand: manual stone crushing and stone crushing using jaw crushers and other industrial machines. Both sites were visited to compare dust emission conditions. In the industrial site, it was

hard to breathe, owing to the massive dust emissions. On the other hand, manual stone crushers were facing the typical risks of getting hurt or blinded by the stone chips. Though there are several International and Indian Laws that advocate, promote, and protect workers' safety, it was commonly seen that the workers were working on this site without wearing any Personal Protective Equipment. This field-based qualitative study tends to analyze and highlight such an important topic, which is not only common among the stone crushers, but also prevalent among the miners, construction workers, brick, tile industry, and sandblasting industry worldwide. The goal of this research is to spread awareness worldwide through this case study and create safe working conditions for the workers.

Keywords:

Silicosis, Public Health, Human Rights, Occupational Health Hazards, Stone Crushing

1. Introduction

1.1 Background

Stones, essential to the masonry industry, are crafted in various shapes and sizes and play a vital role in construction and infrastructure development. The laborers involved in stone mining and crushing are considered the backbone of this progress, yet they face serious occupational hazards. Prolonged exposure to silica dust puts these workers at high risk of developing lung diseases such as silicosis, along with other physical injuries. Estimates indicate that India's construction sector employs around 71 million workers, a significant part of which consists of the masonry workers. Despite the industry's importance, the masonry sector in India remains largely unorganized, leading to a lack of comprehensive data on the exact number of stone crushers. According to the Open Government Data (Open Government Data (OGD) Platform India), these laborers are typically paid based on the size or quantity of stones they crush, with recorded wage ranges from 2017 to 2022, reflecting the nature of their daily wage.

Table 1.1 *Daily Wage of Laborers working in the Stone Crushing Industry*

Stone crushing for the size of category	**Wage Rate per Day in Rs (₹) [USD ($)] (01/19/2017)**	**Wage Rate per Day in Rs (₹) [USD ($)] (10/01/2022)**
1.0 inch to 1.5 inches	₹2171 [$25.41]	₹2938 [$34.39]
Above 1.5 inches to 3.0 inches	₹1857 [$21.74]	₹2513 [$29.42]
Above 3.0 inches to 5.0 inches	₹1088 [$12.74]	₹1475 [$17.27]
Above 5.0 inches	₹893 [$10.45]	₹1212 [$14.19]

In India, various labor safety, health, and environmental laws have been established to safeguard the human rights of workers in the stone mining and crushing industry. These regulations aim to ensure safe working conditions, promote workers' well-being, and mitigate environmental harm. The table below outlines key legislation, its intended purposes, and the common violations observed in workplace settings.

Table 1.2 *Various Acts Protecting Laborers in the Stone Crushing Industry*

Act Name	**Purpose**	**Common Violations**
Mines Act, 1952	To regulate the safety and welfare of laborers in mines	Many small quarries are unregistered to avoid compliance with the law

Factories Act, 1948	To govern working conditions in factories, making sure that it is safe for workers	Small stone processing units often operate informally are not detected by the government; thus, they are not affected by the law
Minimum Wages Act, 1948	To ensure that there is a minimum wage throughout the country	Many workers are often underpaid, and they do not receive formal wages
Air (Prevention and Control of Pollution) Act, 1981	To control dust and air pollution	Quarries often lack basic dust control or pollution checks
Building and Other Construction Workers (BOCW) Act, 1996	Safeguard the rights of and welfare of construction workers, who often operate under hazardous conditions	Employers may not offer the protection (PPE Kits, etc.) or compensation (due to injury risks)
Occupational Safety, Health and Working Conditions Code, 2020	To establish national workplace safety norms	The law is not yet in force (As of writing this paper). Implementation of the OSH Code remains pending until all states legislate this process

1.2 Silicosis: *The Deadly Dust*

According to the American Lung Association, silicosis is a chronic and often debilitating lung disease caused by inhaling crystalline silica particles—a mineral commonly found in sand, quartz, granite, and various types of stone. These particles are released into the air during activities such as cutting, grinding, drilling, or crushing stone, which makes workers in industries like construction, mining, and masonry particularly vulnerable. Once inhaled, the fine silica dust settles deep in the lungs, leading to inflammation and scarring that gradually impairs respiratory function. Over time, continued exposure can result in irreversible lung damage and, in severe cases, can be fatal. The most common symptoms of silicosis include a persistent cough, shortness of breath, chest tightness, and difficulty breathing (*Silicosis Symptoms and Diagnosis | American Lung Association*). Unfortunately, these symptoms often develop slowly and may not appear until after years of exposure, making early detection and prevention difficult. With the continued advancement of industrialization and the rapid growth of infrastructure projects worldwide, silicosis has become one of the most urgent occupational and public health concerns.

According to the Institute for Health Metrics and Evaluation, an estimated 2.65 million cases of silicosis were reported globally in 2019, highlighting the widespread and persistent nature of this entirely preventable disease.

According to a 2025 report by *The Lancet*, approximately 52 million workers in India were employed in occupations related to silica dust, which is a significant increase from the approximate 11.5 million workers back in 2015. At the National Conference on Silicosis held in July 2024 at the India International Center in New Delhi, it was reported that India's mining industries are predominantly concentrated in the states of Jharkhand, Odisha, Chhattisgarh, and West Bengal. During the conference, an expert group on silicosis presented key insights and proposed a range of strategies to address this pressing occupational health hazard. The group emphasized both preventive and remedial measures aimed at reducing the impact of silicosis on laborers and their families. Among the recommended actions were the following critical points:

- The implementation of precautionary measures, including the mandatory provision of protective gear for workers in silicosis-prone industries, should be enforced by the relevant regulatory authorities.
- Dust control devices should be installed in workplaces to minimize dust generation and limit workers' exposure to harmful silica particles. The National Institute of Occupational Health (NIOH) has developed specialized control devices for the agate grinding and quartz crushing industries, based on the principle of local exhaust ventilation. In addition, the use of wet drilling techniques and dust extractors should be mandated and strictly enforced by the appropriate regulatory authorities to further enhance workplace safety.
- Occupational health and dust surveys should be conducted on a semi-annual basis in industries identified as potentially hazardous. It should be mandatory for all enrolled workers to undergo a comprehensive medical examination before the commencement of employment. These health screenings must include clinical evaluations such as chest radiography and pulmonary function tests to detect any existing or early signs of respiratory disorders, ensuring only medically fit individuals are deployed in high-risk environments.
- The workers vulnerable to silicosis need to be made aware of the disease through wide publicity campaigns with the use of electronic and print media. This will also improve the self-response to cases and facilitate early detection.

- In each of the districts where silicosis-prone industries, quarrying, or big construction projects are on, there is a need to identify a facility for the diagnosis of silicosis.

2. Objective of the Research

The primary focus of this research was to examine the socio-economic conditions, occupational health, and safety of laborers working in the stone crushing industry in North Bengal, India. The study also aimed to assess workers' access to healthcare services and protective measures, evaluate government efforts to implement relevant regulations and safeguard labor rights, and explore workers' awareness and perceptions regarding occupational health hazards, including life-threatening diseases such as silicosis and lung cancer. Additionally, the research sought to identify the gap between existing labor and environmental protection laws and their actual implementation on the ground.

During my research, I have come across numerous studies that address important issues such as physical injuries, the gap between legislation and its enforcement, child labor, and wage-related challenges in labor-intensive industries. However, I was deeply struck by how little attention has been given to the silent and deadly threat of silicosis, the broader spectrum of occupational health hazards, and the lack of access to basic safety and health rights for workers. This absence of focus on the human cost of neglect—on the lives slowly deteriorating in the dust of stone crushing, moved me profoundly. As a researcher, I felt a strong responsibility to bridge this gap and bring a more human, compassionate perspective to this subject, one that amplifies the voices of those who are too often overlooked.

3. The Study Area and People

Several decades ago, migrants from the Rajbanshi ethnic group in Bangladesh began settling along the banks of the Balason River, a region now known as Balason Colony in the Darjeeling district of West Bengal. Drawn by the natural abundance of the land, they found the riverbed rich with boulders, gravel, and sand—materials that could be freely extracted, required minimal processing, and were naturally replenished by the river over time. This easy access to raw materials made stone crushing a practical and immediate means of livelihood. According to the study *"Geomorphic Diversity and Landslide Susceptibility in the Balason River Basin, Darjeeling Himalaya,"* the basin is primarily composed of metamorphosed rocks such as gneiss, slate,

phyllite, and schist, which are ideal for stone crushing. With stones readily available, the migrants naturally adopted this work as their primary occupation, not only to earn a living but also as a foundation for building a new life along the river. Both men and women became actively involved in the labor-intensive process—collecting pebbles and boulders from the riverbed, crushing them into various sizes based on factory demand, and transporting the finished materials to nearby truck loading sites. This occupation became central to their identity, binding them to the river that both nurtured and challenged their existence.

Observations indicated that stone crushing in the area is carried out through both manual and mechanized methods. While a portion of the laborers still rely on traditional hand tools for breaking stones, many have shifted to using industrial machines. Workers explained that, in the initial stages, manual crushing was the only available option due to the lack of infrastructure and access to technology. Over time, with the gradual introduction of industrial machinery, the nature of the work has evolved. The use of machines has enabled the production of stones in various sizes to meet market demands more efficiently, reducing physical labor while increasing output. This shift represents a significant development in the working conditions and productivity within the local stone crushing industry.

The Balason Colony and its surrounding areas were found to have a total of 35 dug wells and 5 deep tubewells, which serve as the primary sources of drinking water and household use. Educational facilities in the region include two schools located in and around the colony. The village also has access to electricity, with households connected to the power grid. In terms of healthcare infrastructure, there is one health center known as the Leninpur Sub-Health Centre, which provides services to five villages, including Balason Colony. The center is staffed by a Community Health Officer, two female Health Assistants, and nine ASHA (Accredited Social Health Activist) workers who conduct regular household visits to assist with health check-ups and basic medical care.

4. Research Methodology

A field-based qualitative study was conducted in the Balason Colony, focusing on the stone-crushing laborers and their families residing in the area. Over three years (2022–2024), primary data was collected through interviews with over 200 laborers. The objective of these

interviews was to gain insights into their socio-economic conditions, occupational experiences, and overall health status.

After reviewing a wide range of literature on masonry and mine workers, occupational health hazards, the impact of silicosis, and relevant Indian and international legal provisions, a comprehensive questionnaire was developed to collect quantitative data. In addition to the broader survey, approximately 30 laborers were selected for in-depth interviews using a case study approach to gain a deeper understanding of their lived experiences. Alongside these methods, participant observation, detailed field notes, and narrative analysis played a crucial role in capturing the social and contextual dimensions of the research.

5. Demographics of the Respondents

A total of 203 respondents from the stone crushing site in the Balason area of West Bengal were interviewed. Among them, 149 were female and 54 were male. Of the female respondents, two were exceptions: one had discontinued stone crushing work, while the other had never been engaged in the activity. The remaining participants were actively involved in the stone crushing industry at the time of the survey.

The age of respondents in the stone crushing field ranged from 24 to 89 years. However, obtaining accurate data on their ages proved challenging, as none of the participants possessed official birth certificates. As a result, age estimates were based on the respondents' own assumptions and the researchers' observations of their physical appearance.

Table 1.3 *Hours of Working in the Stone Crushing Field by Gender*

	6 to 8 hrs	**9 to 11 hrs**	**12 + hrs**	**Not involved in Stone Crushing**	**Total**
F	18	107	22	2	**149**
M	5	36	13	0	**54**
Total	**23**	**143**	**35**	**2**	**203**

Table 1.4 *Years of Working in the Stone Crushing Field by Gender*

	0-6 yrs	10-14 yrs	15-19 yrs	20-24 yrs	25-29 yrs	30-34 yrs	35-39 yrs	40+ yrs	Total
F	1	12	6	40	15	49	14	12	**149**
M	0	0	3	5	9	24	8	5	**54**
Total	**1**	**12**	**9**	**45**	**24**	**73**	**22**	**17**	**203**

From the data presented in the tables above, it is evident that out of the 203 respondents, 143 laborers reported working between 9 to 11 hours per day, while 35 laborers work more than 12 hours daily to earn their livelihood. It was also observed that 95 laborers have been engaged in this occupation for 30 to 39 years, 69 for 20 to 29 years, 21 for 10 to 19 years, and 17 individuals have been working in this field for over 40 years. Despite their long-term involvement in stone crushing, many of these workers remain completely unaware of the serious health risks associated with their hazardous occupation.

"Our life starts with stone crushing and ends with stone crushing," remarked one of the laborers, capturing the deep dependence on this exhausting occupation. In the Balason area, workers are paid by volume (measured in cubic feet (CFT)), not by fixed hours, which means they often work from early morning until late in the day to earn as much as possible. The more they crush, the more they can earn, which is critical for supporting their families. A full truckload of crushed stone typically sells for ₹2,500 to ₹3,000 ($29.38 to $35.25), but it takes about a week or more to complete one load. This makes the work not only physically demanding but also time-consuming, with minimal returns. For many, this cycle has become a way of life, passed down through generations with few alternatives available.

6. Workers' Health Impact

6.1 Data from the respondents

The primary objective of this study is to investigate the health impacts faced by laborers working in hazardous stone crushing environments. During field visits, it was evident that none of the workers used any form of protective gear or masks to shield themselves, either from physical injuries caused by handling heavy machinery and crushing stones manually, or from the constant inhalation of silica dust generated throughout the day. The working conditions were alarming; the air was thick with dust, and even short exposure made it difficult for us, as researchers, to breathe. This raises serious concerns about the long-term health consequences for laborers who are exposed to such conditions daily, without any basic safety measures in place.

It has already been observed that most laborers work between 9 to 11 hours each day, with many having been engaged in this occupation for the past 20, 30, or even 40 years. Such prolonged and continuous exposure to a highly hazardous environment, without adequate safety measures, has undoubtedly taken a serious toll on their health. The combination of long working hours and years of inhaling silica dust, along with frequent physical strain, has led to the gradual deterioration of their well-being. This long-term vulnerability highlights the urgent need for improved occupational safety protocols and regular health monitoring in the stone crushing industry.

Table 1.5 *Continuous Coughing and years of working*

Working Years	No	Yes	Total	% Responded Yes to Continuous Coughing
6	1	0	1	0%
10 to 14	12	0	12	0%
15 to 19	5	4	9	44%
20 to 24	33	12	45	27%
25 to 29	14	10	24	41%
30 to 34	50	23	73	32%
35 to 39	16	6	22	27%
40+	9	8	17	47%
Total	**140**	**63**	**203**	**31%**

Table 1.5 *Shortness of Breath and years of working*

Working Years	No	Yes	Total	% Responded Yes to Shortness of Breath
6	1	0	1	0%
10 to 14	7	5	12	41%
15 to 19	6	3	9	33%
20 to 24	17	28	45	62%
25 to 29	10	14	24	58%
30 to 34	26	47	73	64%
35 to 39	7	15	22	68%
40+	1	16	17	94%
Total	**75**	**128**	**203**	**63%**

Table 1.6 *Tightness of Chest and years of working*

Working Years	N/A	No	Yes	Total	% of Responded Yes to Tightness of Chest
6	0	1	0	1	0%
10 to 14	0	8	4	12	33%
15 to 19	1	6	2	9	22%
20 to 24	7	23	15	45	33%
25 to 29	2	11	11	24	46%
30 to 34	14	29	30	73	41%
35 to 39	7	8	7	22	32%
40+	7	3	7	17	41%
Total	**38**	**89**	**76**	**203**	**37%**

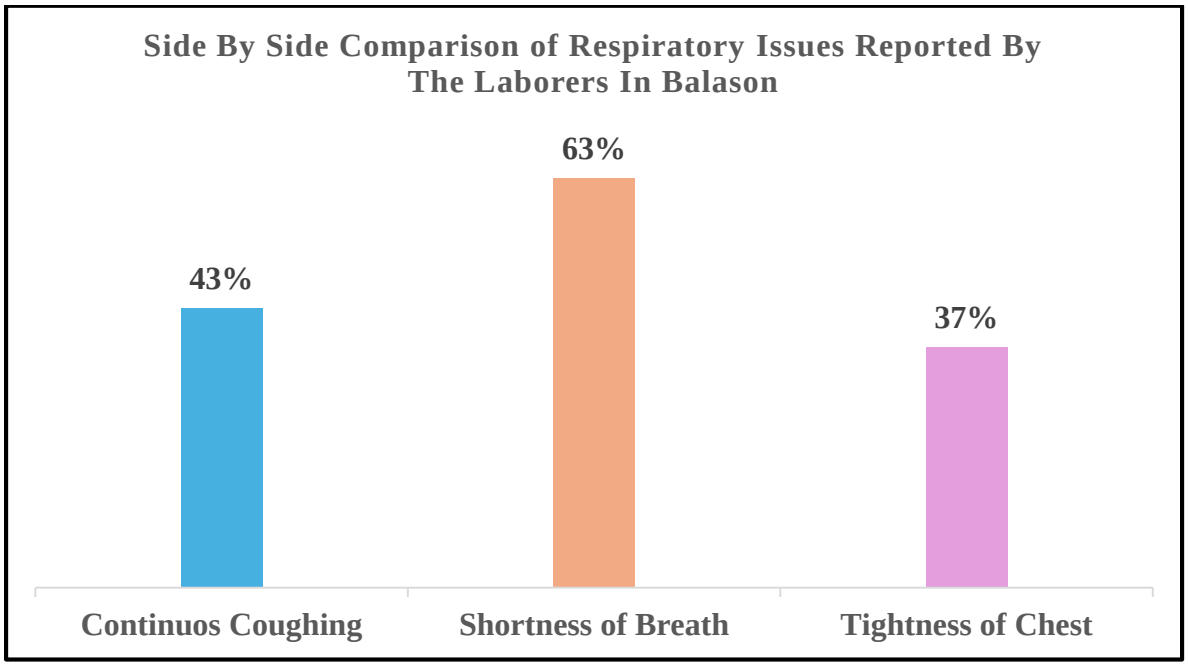

Figure 1: *Respiratory Symptoms Observed Among the Laborers*

In the analysis above, it can be concluded that the number of years spent working at stone crushing sites and the long daily working hours are directly linked to an increased risk of developing silicosis. Prolonged exposure to silica dust significantly raises the chances of experiencing respiratory issues. The most common and early symptoms reported include persistent coughing, shortness of breath, and a constant feeling of tightness in the chest—classic indicators of silicosis. These findings underscore the critical need for preventive measures and early health screenings among workers in such high-risk environments.

There were also several cases reported of Tuberculosis (TB) among the laborers and their families working at the stone crushing site. A total of 22 respondents stated that either they or their family members had been affected by TB. Out of these, 10 laborers confirmed that they had been personally diagnosed with the disease. Some respondents shared tragic stories of loss, reporting that three of their close family members—husbands, sons, or daughters—who were also involved in stone crushing had died due to TB. One respondent recalled that doctors initially diagnosed her with TB, but later confirmed that she was actually suffering from lung cancer. Additionally, 8 respondents said their close family members were currently under medical supervision for TB, yet continued to work in the stone crushing industry out of financial necessity. These cases highlight the severe health toll this occupation takes, as well as the desperation that compels affected individuals to keep working despite life-threatening illnesses.

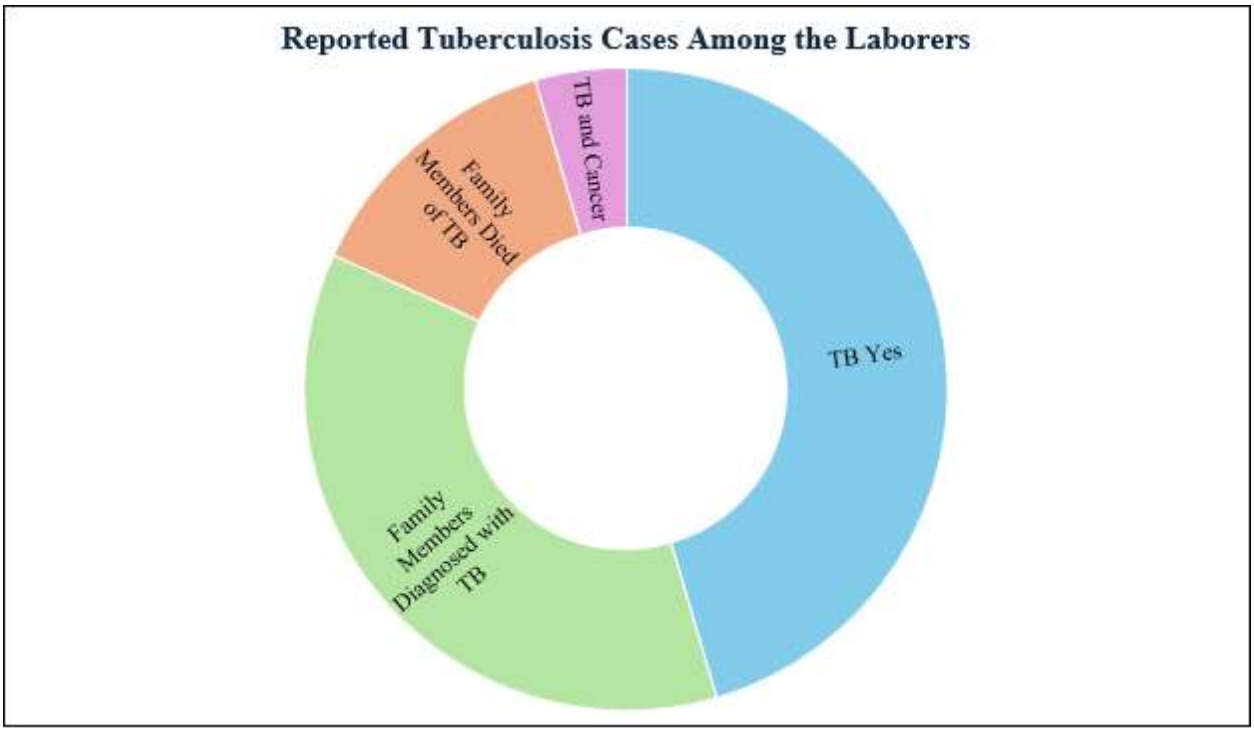

Figure 2: *Tuberculosis Reported Among the Laborers*

Apart from respiratory diseases, workers in the stone crushing industry also suffer from frequent physical injuries. finger injuries, nail damage, and other hand-related issues are common due to constant manual handling of heavy stones and tools. Eye injuries are also a regular occurrence—sand particles often enter the eyes, causing irritation and blurred vision, while sharp stone splinters

can strike the eyes, leading to severe complications and even blindness. Another major risk involves carrying heavy baskets full of crushed stones on their heads while crossing the river, which increases the chances of falls, back injuries, and head trauma. These injuries, though often overlooked, are part of the daily reality for laborers in this hazardous occupation.

Table 1.7 *Different Types of Bodily Injuries Reported Among the Laborers*

Types of Injuries	No	Yes	N/A
Finger Injury	8	194	1
Other Bodily Injuries	5	197	1
Eye Injuries	9	194	0
Hit by Splinters	21	181	1

6.2 Data Collected from the Local Health Center

There is one Health Sub-Centre in Balason Colony, known as the Leninpur Sub-Health Centre, which provides healthcare services to five surrounding villages, including Balason Colony itself. The center is staffed by a Community Health Officer, two female Health Assistants, and nine ASHA (Accredited Social Health Activist) workers who regularly visit households to monitor and assist in improving residents' health conditions. The Community Health Officer has been in service since July 2020. According to her observations, common ailments among children in the area include diarrhea, skin diseases, the common cold, and fever. Among adults, the most frequently reported health issues are skin diseases, high blood sugar, hypertension, gastric problems, breathing difficulties, dust allergies, and tuberculosis. The number of tuberculosis patients treated at the center between June and August 2022 is detailed in the following data.

Table 1.8 *TB Patient treated in Health Sub-Centre at Balason Colony*

Month	Total Patients treated	Male	Female
June, 2022	22	14 (64%)	8 (36%)
July, 2022	12	5 (42%)	7 (58%)
August, 2022	18	13 (72%)	5 (28%)

Stone crushing also severely affects the eyes and vision of laborers, as constant exposure to airborne sand particles often leads to irritation and injury. The Community Health Officer reported that while cases of complete blindness cannot be treated at the Leninpur Sub-Health Centre, several

patients with blurred vision have been identified and treated. The number of such patients recorded at the health center between June 2022 and August 2022 is provided below.

Table 1.9 *Patient with Blurred of Vision in Health Sub-Centre at Balason Colony*

Month	Total Patients Treated	Male	Female
June,2022	20	7 (35%)	13 (65%)
July, 2022	12	5 (42%)	7 (58%)
August, 2022	14	3 (21%)	11 (79%)

According to the Community Health Officer's observation, another significant health concern in Balason Colony and its surrounding villages is Chronic Obstructive Pulmonary Disease (COPD). This condition, often caused by prolonged exposure to dust and poor air quality, is increasingly common among residents, particularly those engaged in stone crushing. The data on COPD cases treated at the Leninpur Sub-Health Centre over three months is presented below.

Table 1.10 *Patient with COPD in Health Sub-Centre at Balason Colony*

Month	Total	Male	Female
June, 2022	9	5 (56%)	4 (44%)
July, 2022	16	7 (44%)	9 (56%)
August 2022	6	2 (33%)	4 (67%)

According to the observations of the health center workers, many laborers frequently visit the center to seek treatment for musculoskeletal issues such as back pain, shoulder pain, joint pain, and neck stiffness. These ailments are common among stone crushers due to the physically demanding nature of their work, prolonged hours of heavy lifting, and repetitive movements involved in manual stone crushing and transporting loads.

7. Conclusion

The plight of stone crushing laborers in regions like Balason Colony reflects a heartbreaking intersection of poverty, exploitation, and neglect. Driven by poor living conditions and the absence of alternative livelihoods, these workers, many of whom are women, engage in hazardous stone crushing work for long hours each day to earn a minimal income. While government data suggests the existence of structured wage systems, reality tells a different story:

one truckload of stones, requiring a week or more of intense labor, earns only ₹2,500– ₹3,000 ($29.38–$35.25). This stark gap between official figures and ground-level earnings reveals the economic disparity and daily struggles these workers face. Despite being surrounded by layers of dust and harmful particles, they continue their work without proper protective gear or workplace safety. The environment is not just physically harsh, but dangerously toxic, causing irreversible lung diseases like silicosis, tuberculosis, and COPD. Persistent cough, shortness of breath, and fatigue have become normalized symptoms among them, a cruel reminder of the cost they pay to survive.

What worsens their condition is the failure to implement existing Indian labor and health laws, which are meant to protect workers in hazardous industries. While legal frameworks exist, enforcement is weak, and access to health care remains limited. Sub-health centers, though present, are often under-equipped and insufficient to serve entire communities. The gap between government recommendations and actual services only deepens the crisis, violating fundamental human rights. These laborers are not just statistics; they are people trapped in a system that prioritizes output over well-being. To protect them, both the government and industries must act urgently by installing dust control devices, mandating the use of protective gear, ensuring fair wages, and offering regular health screenings. Above all, these workers must be seen, heard, and valued—not as invisible labor behind infrastructure, but as human beings deserving of dignity, safety, and care.

The data collected in this study is specific to Balason Colony in West Bengal at a particular time between 2022 - 2024. However, the research model, using interviews, case studies, and field observations, can be applied globally in similar labor-intensive industries. It offers a practical approach to understanding workers' conditions, identifying health risks, and guiding policy interventions.

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