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Occupational health hazards for the marble industry worker

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Abstract

Exposure to marble dust poses significant risks, causing various pulmonary diseases among workers in the marble stone industries. This study aimed to identify the occupational health risks associated with dust exposure for workers in Jaipur City. Marble dust contain high concentrations of silica and heavy metals. In the marble industry 65% male persons were working. The highest age was recorded 31-40 years. The educational level will be recorded at 62.5% persons were literate. The job designation was recorded at 27.5% of workers were in marble cutting. In the common respiratory symptoms were recorded that 26% were suffering from chest pain, 20% workers weight loss, 19% workers of shortness of breath, 18% of worker of loss of Appetite and 17% workers of facing cough problems.

Prolonged exposure to silica can lead to silicosis and emphysema, a type of chronic obstructive pulmonary disease (COPD). Dust deposition on the skin and eyes can cause irritation and may result in conjunctivitis. Additionally, heavy metal accumulation can lead to kidney and brain damage, as well as lung cancer. The study was designed to investigate the effects of airborne dust on the lung function of construction workers, and it also examined the knowledge, practices, and perceptions of sandstone quarry workers regarding these health risks. These problems mainly are related to the Eye vision, breathing, chest, loss Appetite and Weight loss. As far concern with Eye Sight vision breathing and loss of appetite have positive relation. Whereas Chest pain has positive concern with eye aspect of the above table. Same as Breathing, loss appetite and Weight Loss. The above correlation has 0.01 and 0.05 Level of Significance 2 tail.

Keywords: Marble dust, lung disease, cough, shortness of breath

Introduction

Occupational health hazards encompass workplace activities that pose the potential to induce or exacerbate the risk of injury or illness. These hazards are prevalent across various occupations, where workers encounter a myriad of potential risks. Such risks are not limited to specific job roles; rather, they permeate diverse work environments, contributing to the overall occupational health challenges faced by workers. (Selvi, 2020) [1]. One of the critical areas currently facing governmental negligence is the welfare of workers employed in the marble industry, who lack access to basic safety precautions against occupational hazards. There is an urgent necessity to identify and address the specific occupational health and safety (OHS) risks prevalent in this sector. The effectiveness of the OHS system is contingent upon the industry's scale and operations, necessitating tailored approaches for various contexts. Developing occupational health and safety management systems (OHS MS) for large-scale industries and complex organizations is comparatively less challenging than for small-scale enterprises, given their resource limitations and other constraints (Zahra *et al.*, 2014) [2]. The stone and marble industry has had a notable adverse effect on public health, affecting both workers directly involved in the industry and residents living in its vicinity. This impact extends to the well-being of the surrounding environment and ecosystems. These repercussions stem from activities such as rock quarrying and crushing, large-scale stone cutting and polishing in stone-cutting facilities, transportation of rocks, as well as construction sites. (Salem, 2021) [3]. Individuals working in environments with high levels of dust face the risk of inhaling particulate materials, which can lead to adverse respiratory effects. All construction sites typically generate significant amounts of dust, stemming from materials such as concrete, silica, asbestos, cement, wood, stone, and sand.

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Workers are regularly exposed to this airborne dust. Inhaling dust and cement particles can lead to lung irritation, increased mucus production, and subsequent impairment of lung function. This can progress to conditions such as lung inflammation, chronic obstructive pulmonary disease (COPD), restrictive lung disease, pneumoconiosis, and more. Street sweeping is also associated with dust exposure. Workers involved in sweeping streets with brooms, as well as those exposed to dust from vehicular movement and other human activities, inhale considerable amounts of dust particles. This prolonged exposure can result in respiratory problems, lung cancer, and other types of cancer (Avasthi & Chavda, 2018) ^[4].

Occupational Health and Safety encompasses a range of disciplines, including epidemiology, industrial hygiene, occupational nursing, toxicology, engineering, and more. It addresses the conditions and environments that impact workers and other individuals in the workplace. Occupational Health and Safety practices play a vital role in improving productivity and reducing workplace accidents by providing ongoing guidance on worker performance (Vinod Kumar, 2005) ^[6]. The International Labor Organization (ILO) has emphasized that occupational accidents profoundly impact human lives, with an estimated 317 million occurring annually.

Water pollution refers to the contamination of water bodies, which happens when pollutants are released directly or indirectly into them without sufficient treatment to remove harmful substances (Colic *et al.*, 2010) ^[7]. Dust pollution originating from marble and cement presents numerous health hazards to workers, including respiratory issues, skin irritation, and eye problems. Depending on the chemical composition and concentration of the dust, workers may inhale silica-laden particles, putting them at risk of developing silicosis, a fatal lung condition. Exposure to substances such as flock and silica can lead to fibro sing lung diseases, while exposure to carcinogens like asbestos and beryllium can increase the risk of cancer. Numerous studies have investigated work-related respiratory symptoms and ventilatory disorders among cutting and cement workers. Silicosis, a form of pneumoconiosis, is an occupational lung disease resulting from inhaling crystalline silica dust. It is characterized by inflammation and scarring, forming nodular lesions primarily in the upper lobes of the lungs. Emphysema is another chronic obstructive pulmonary disease (COPD) variant.

Significance of the Study

Marble sector is highly competitive and holds significant global importance in socio-economic terms, providing employment opportunities to thousands of workers. The industry has experienced substantial growth and has become increasingly competitive.

According to recent estimates from the International Labour Organization (ILO), approximately 2.78 million workers worldwide succumb to occupational accidents and work-related diseases annually. Among these, 86.3% (approximately 2.4 million) of deaths are attributed to work-related diseases, while over 13.7% (more than 380,000) result from occupational accidents. Non-fatal occupational injuries greatly outnumber fatal ones, with an estimated 374 million workers affected annually. Many of these injuries have severe long-term consequences for workers' earning capacity (Morgado *et al.*, 2019) ^[5].

Objective of the study

The objective of the study was to evaluate the occupational health risks faced by workers in marble and granite workshops located in Jaipur City.

Material and Methods

1. **Study Area:** Jaipur is renowned for its stunning beauty and marble rock formations. Located near Jaipur, Rajasthan, it is surrounded by small shops where marble cutting workers are regularly exposed to marble dust. The mechanical operations involved in cutting marble produce significant noise pollution and generate dust. Follow-up surveys and repeat assessments were conducted during the study. One hundred twenty workers were randomly selected from various shops in Jaipur using a simple random sampling method. Workers were questioned about environmental conditions and their utilization of preventive measures through a set of questionnaires administered by a team of volunteers.
2. **Inclusion Criteria:** Our study included both male and female residents of Jaipur City who had been living there for durations ranging from 10 to 25 years. These individuals were employed in various marble shops and stone cutting establishments.
3. **Exclusion Criteria:** Subjects with pre-existing respiratory illnesses such as tuberculosis, emphysema, pneumonia, asthma, etc., were excluded from the study. Additionally, individuals who did not provide consent were also excluded.
4. **Sampling procedure & Sample Size:** In Jaipur city, there were a total of 25 sites employing marble workers. These workers were stratified into three groups to account for varying levels of dust exposure. The first stratum consisted of quarry pit workers, the second included those working at the crushing plant, and the third comprised mechanics and office workers. The total number of marble worker was randomly selected of 200 people.

Results and Discussion

General information of respondents

General information about the subjects was collected through a structured interview schedule and is summarized below:

Age: Table 1 illustrates that the highest age group, accounting for 37.5%, falls between 31-40 years. The second highest age group, comprising 32.5%, falls between 41-50 years. Additionally, the lowest age group, representing 5%, falls between 11-20 years. The remaining 25% are aged between 21-30 years.

Gender: Table 1 shows that the highest percentage, 65%, consists of males working in the marble industry, while 35% are females.

Education qualification: Table 1 indicates that 42.5% of individuals are illiterate. Furthermore, 37.5% have completed secondary education, and 20% have completed senior secondary education.

Total monthly income: It is evident from Table 1 that the highest recorded income is 40% earning Rs. 10,000 per month. The second-highest income range falls between Rs.

10,001-20,000 per month. Moreover, the lowest income range is recorded for those earning Rs. 20,000 & above per month.

Table 1: Demographic area of the marble industry worker

	N	Percentage (%)
Age Distribution		
11-20 yrs.	10	5
21-30 yrs.	50	25
31-40 yrs.	75	37.5
41-50 yrs.	65	32.5
Gender		
Male	130	65
Female	70	35
Education Qualification		
Secondary	75	37.5
Senior Secondary	40	20
Illiterate	85	42.5
Total monthly Income (in Rs.)		
10,000	80	40
10,001-20,000	70	35
20,000 & above	50	25

Table 2: Job designation of worker

	N	Percentage (%)
Marble cutting	55	27.5
Marble mining process	70	35
Marble loading	40	20
Others	35	17.5

Table 2 illustrates that the majority of workers were engaged in marble mining (35%) and cutting (27.5%) activities. Approximately 20% of workers were involved in loading marble blocks, while the remaining 17.5% were assigned to various other tasks such as pulling trolleys, marble finishing, and cleaning.

Table 3: Common Respiratory Symptoms

Common respiratory symptoms	N	Percentage
Shortness of Breath	38	19
Chest Pain	52	26
Cough	34	17
Loss of Appetite	36	18
Weight Loss	40	20

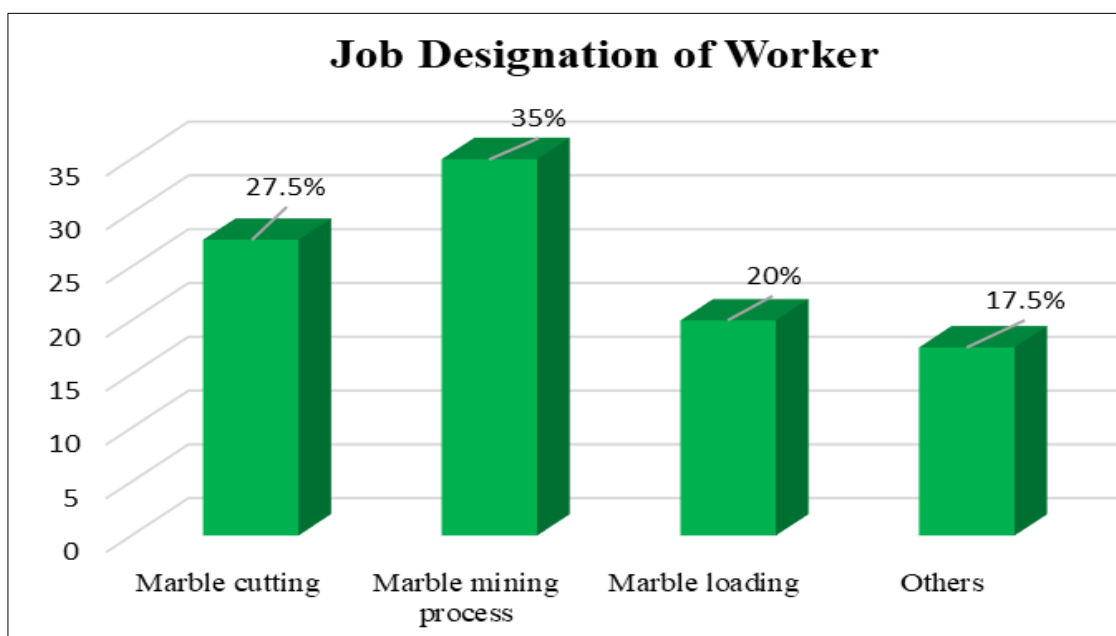


Fig 1: Job Designation of worker

Table 3 indicates that the most prevalent respiratory symptom among the workers was chest pain (26%), followed by weight loss (20%), shortness of breath (19%), loss of appetite (18%), and cough (17%).

Table 4 shows that before the intervention, 20% of workers were using safety measures. Among them, 30% were using face masks, 25% were using aprons, 17% were using other

devices, 15% were using gloves, and 13% were using spaces. After the educational intervention provided by investigators, around 80% of workers reported using various safety measures. Specifically, 36% were using aprons, 30% were using face masks, 13% were using gloves, 11% were using other devices, and 10% were using spaces..

Table 4: Various types of protective measures used

Use of safety Measures	N (Before Intervention) %	N (After intervention) %
Use of face mask	12 (30%)	45 (30%)
Use of apron	10 (25%)	55 (36%)
Use of gloves	6 (15%)	30 (13%)
Use of spaces	5 (13%)	15 (10%)
Use of other devices	7 (17%)	15 (11%)

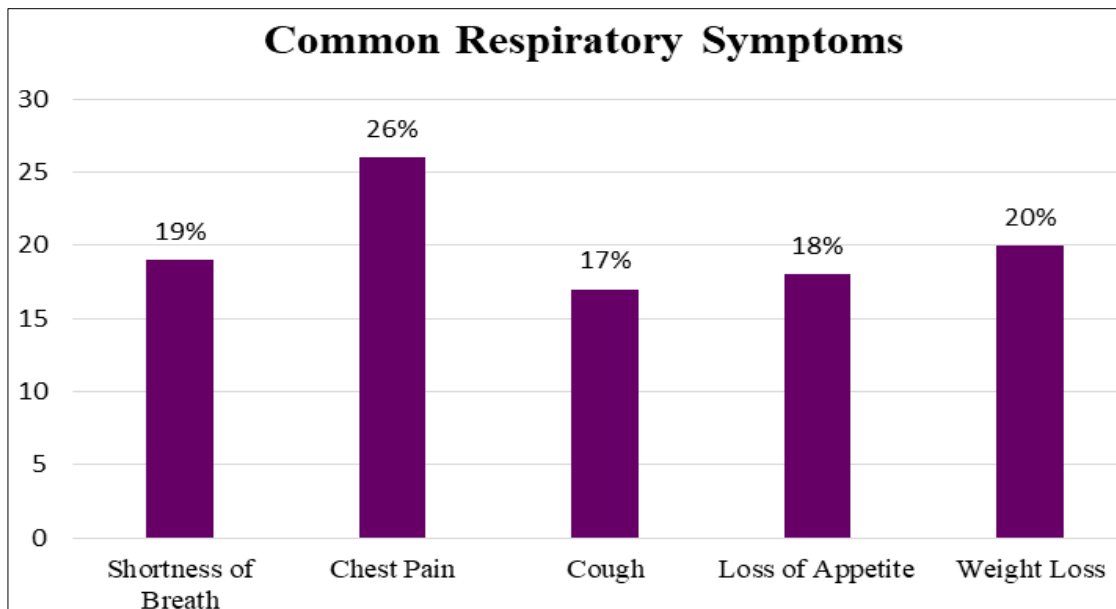


Fig 2: Common Respiratory Symptoms

Table 5 Correlation between eye sight (vision problem), breathing pain, chest pain, loss appetite and weight loss.

Table 5: Correlations

		Eye Sight Vision Problem	Breathing Problem	Chest Pain	Loss Appetite	Weight Loss	
Kendall's tau_b	Eye Sight Vision Problem	Correlation Coefficient	1.000	-.009	.092	-.049	-.087
		Sig. (2-tailed)	.	.898	.165	.460	.190
		N	200	200	200	200	200
	Breathing Problem	Correlation Coefficient	-.009	1.000	-.079	-.028	.356**
		Sig. (2-tailed)	.898	.	.231	.672	.000
		N	200	200	200	200	200
	Chest Pain	Correlation Coefficient	.092	-.079	1.000	-.124	-.160*
		Sig. (2-tailed)	.165	.231	.	.060	.017
		N	200	200	200	200	200
	Loss Appetite	Correlation Coefficient	-.049	-.028	-.124	1.000	-.029
		Sig. (2-tailed)	.460	.672	.060	.	.660
		N	200	200	200	200	200
	Weight Loss	Correlation Coefficient	-.087	.356**	-.160*	-.029	1.000
		Sig. (2-tailed)	.190	.000	.017	.660	.
		N	200	200	200	200	200

** . Correlation is significant at the 0.01 level (2-tailed).

* . Correlation is significant at the 0.05 level (2-tailed).

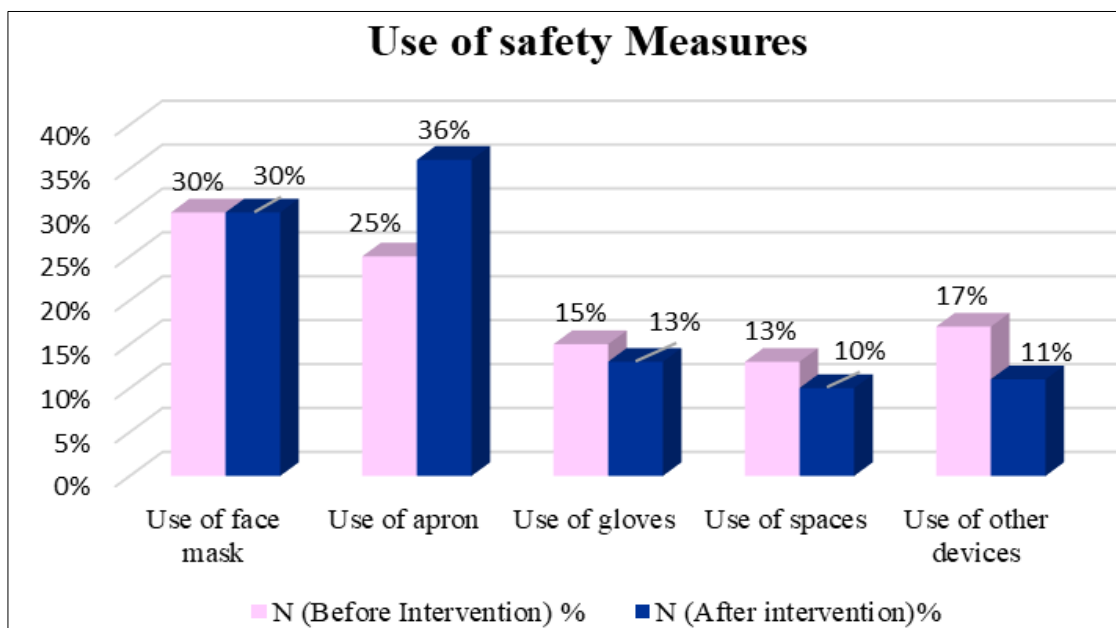


Fig 3: Use of safety measures

Inferences

The above Table: 5 disclose facts in concern to the health issue among the marble employees who are working at the Jaipur different location workshops. These problems mainly are related to the Eye vision, breathing, chest, loss Appetite and Weight loss. As far concern with Eye Sight vision breathing and loss of appetite have positive relation. Whereas Chest pain has positive concern with eye aspect of the above table. Same as Breathing, loss appetite and Weight Loss. The above correlation has 0.01 and 0.05 Level of Significance 2 tail.

Conclusion

Prevention is crucial in reducing the incidence of occupational lung diseases. Early intervention after the onset of symptoms is essential, as it can prevent the condition from worsening. Early diagnosis and treatment are vital because prolonged exposure to risk factors can cause irreversible damage. Health education, periodic health check-ups, and the use of protective measures are fundamental in preventing occupational lung diseases. Educating workers about the hazards of mining and cutting marble, along with raising awareness about personal protective measures, can significantly reduce the prevalence of these diseases. Protective equipment should be designed based on specific needs, appropriate for the area, and acceptable to the target group. A limitation of this study is the lack of advanced investigations such as pulmonary function tests or x-rays due to insufficient funding.

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