

A Study of Occupational Health and Safety Related Practices in Mining Companies of Southern Rajasthan: A Systematic Review

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ABSTRACT

Occupational Health and Safety is one of the most important services. Effective and efficient Occupational Health and Safety measures in industries lead to reduction in number of accidents and loss and injury to human lives, safety to assets, continuous production etc. But the hazards cannot be completely mitigated and thus there is a need to develop and implement Occupational Health and Safety policy in Industries that reduces accident risk to very low level.

In the proposed research paper, 160 studies have been referred and 40 studies have been reviewed, on the theme of Occupational Health and Safety related practices in Mining Companies. Towards the end, a synthesis of reviewed work has also been attempted.

Keywords: *Mining Industries in India and Rajasthan, Occupational Health and Safety, Major Occupational disease (Silicosis), Asbestosis, Scleroderma.*

INTRODUCTION

India is a democratic country with a population of 1.2 billion people where People are belonging to three society i.e. higher, middle and lower class society. People belonging to lower class society are less educated and mostly are illiterate, so to earn money and survive they are engaged in labour work like working in agriculture sector, construction sector, mining sector etc. Mining industries are the major contributor to the economy of India. India is a mineral rich country with more than 20,000 mineral deposits. It produces about 90 minerals, which include four fuels 10 metallic, 50 non-metallic, 3 atomic and 23 minor minerals. India has been ranked 4th on the basis of volume of production amongst the mineral producer countries and has been ranked 8th position on the basis of value of Mineral Production in 2009 by the International Organizing Committee for the World Mining Congress. The mining sector contributes significantly in the India's GDP i.e. 2.2% to 2.5% of the total GDP. Mining industries in India provides job opportunities of around 700,000 individuals. Mining contributes a large portion of employment in India for lower class society. About 95% of all workers are employed informally and half are self employed. Moreover, it has been recognized that remuneration of working women actually has been decreasing in a period of rapid income growth.

Table: 1 Details Of Various Geographical Belts

Mineral Belt	Location	Minerals Found	Silicosis and other related diseases
North Eastern Peninsular Belt	Chota Nagpur plateau and the Orissa plateau covering the states of Jharkhand ,West	Coal, iron ore, manganese, mica, bauxite, copper, kyanite, chromite, beryl, apatiteetic. Khullar calls this region the mineral heartland of India and	Silicosis, Tuberculosis and Asbestosis

	Bengal and Orissa.	further cites studies to state that: 'this region possesses India's 100% Kyanite, 93% iron ore, 84% coal, 70% chromite, 70% mica, 50% fire clay, 45% asbestos, 45% china clay, 20% limestone and 10% manganese	
Central Belt	Chhattisgarh, Andhra Pradesh, Madhya Pradesh and Maharashtra.	Manganese, bauxite, uranium, limestone, marble, coal, gems, mica, graphite etc. exist in large quantities and the net extent of the minerals of the region is yet to be assessed. This is the second largest belt of minerals in the country.	Silicosis and Tuberculosis
Southern Belt	Karnataka plateau and Tamil Nadu.	Ferrous minerals and bauxite. Low diversity.	Silicosis and Tuberculosis
South Western Belt	Karnataka and Goa.	Iron ore, garnet and clay.	Silicosis
North Western Belt	Rajasthan and Gujarat along the Aravali Range.	Nonferrous minerals, uranium, asbestos, mica, beryllium, aquamarine, petroleum, gypsum and emerald.	Silicosis, Tuberculosis, Asbestosis and Scleroderma

Sources:- Mining in India- Wikipedia, the free encyclopedia

1.1 Overview of Mining sector in Rajasthan

Rajasthan, a state located in the north western part of India with the population of 72, 307, 157. Geographically, it covers largest area about 342,239 sq. km of the country. Rajasthan is geographically characterized by sand dunes, fertile plains, rocky undulating land and some forested regions. Rajasthan is the most pre-eminent sector of mines next to agriculture. It is a second largest mineral producer in India and about 90% total mineral reserves in the country. The share of national production of non-metallic minerals is 24%. Thus, mining sector in Rajasthan is prominently revenue earner. Rajasthan produces 42 major and 28 minor minerals. This sector provides employment directly about 4 lakh peoples and indirectly about 20 lakh peoples. Rajasthan produces metallic and non-metallic minerals including renowned building stones and is also produces fuel minerals such as Lignite, Natural gas and Petroleum (Crude oil). Rajasthan is the richest State in terms of availability and variety of minerals in the country. The State has 79 varieties of minerals, out of which 57 are being produced.

Table:- 1.1 Total Production of Minerals in Seven Key States

S. no.	States	Contribution (%)
1.	Odisha	9.6 %
2.	Andhra Pradesh	9.0%
3.	Rajasthan	7.9%
4.	Chhattisgarh	7.8%
5.	Jharkhand	6.5%
6.	Madhya Pradesh	4.8%
7.	Karnataka	3.6%

Sources: - Development of Indian Mining Industry- The Way Forward (FICCI Mines and Metals Division, October 2013)

1.2 Overview of Occupational Health and Safety in India and Rajasthan

Due to globalization and automation in mining companies in India has augmented the need of Occupational Health and Safety policy. Mining is a hazardous operation and consist of considerable environmental, health and safety risk to mine workers. Occupational Health and Safety to miners in mines in India is of a great concern in India. Safety is predominant in mining companies. It has been observed from the statistics on accidents and fatalities in mines that mine owner has not emphasized on the occupational health and there were no safety measures for mine workers and there is eminent need of an effective OHS policy.

The proposed research paper is focused on applicability of Occupational Health which is a disciplinary matter concerned with health and safety of workers at their place of employment. The Occupational Health and Safety (OHS) is a prominent operational research.

In the present communication a systematic review of 156 referred papers have been done in the areas of Mining industries in India and Rajasthan and Occupational Health and Safety in Mining Companies.

Following table (1.2) gives an overview of referred and reviewed papers.

TABLE: 1.2 OVERVIEW OF REVIEWD PAPERS

S. no.	Subject	India		Rajasthan	
		No. of Referred Paper	No. of Reviewed Paper	No. of Referred Paper	No. of Reviewed Paper
1.	Mining Industries	25	4	15	3
2.	Occupational Health and Safety	66	15	–	–
3.	Major Occupational Disease	13	3	27	8
4.	Other Occupational Diseases :- Asbestosis and Scleroderma	7	2	2	1
		4	3	1	1

Source: - Author compiled

2 Review of Literature: - Important reviews which are related to the study are as:-

2.1 Reviews on Mining Industries in India

Minerals are scarce and are raw materials for a number of basic and important industries. According to **Mehta (2002)**, Mining affects the wildlife, water balance, local climate & rainfall, sedimentation and depletion of forests. Safety of mine workers is the most serious problem faced by the Indian mining industries. The miners in mines are facing the health hazards arising out of pollution due to dust, gases, noise and polluted water. In India, many large

industries have adopted the environment friendly processes. The implementation of environmental legislation in India, particularly at state level, has proven to be difficult due to political intervention.

Saviour (2012), stated that sand and soil mining is becoming the environmental issue as the demand for it increases. Soil mining and land degradation are inseparably connected. Unscientific mining has caused degradation of land. Subsidence and consequential mine fires and disturbance of the water table leading to topographic disorder, severe ecological imbalance and damage to land use patterns. Mining operations causes deforestation, habitat destruction and biodiversity erosion. Asthma, irritating the lungs and bronchial passages can be caused due to concentration of dust deposits. Lack of governance and corruption are facilitating the illegal mining, posing depletion of water resources.

Goswami (2013), analyzed that the mining affects the whole eco system and it is important to finding the adverse impact of it. A degraded environment closes the employment opportunities and leads the poor people to criminal activities. Coal dust and Methane in the presence of a source of ignition creates the worst environmental hazard. Environment of underground mines are extremely dangerous because of the constricted geometry, darkness around, suffocating mine atmosphere, heat and humidity. Working under poor light in past has caused miners mustangs. The noise, in the mines, is the major health hazard. Cases of partial hearing loss and even permanent damage to the inner ear after prolonged exposure are noticed. The air absorbing moisture from the underground workings reduces the suspended particulate matter but the fumes of explosives, methane, SO₂, and Oxides of carbon are added to the general body of air. These hostile gases often create negative impact over the surface and the population.

According to **Bamnia, Kapoor & Jain (2012)**, industrialization is the major condition for the growth of a country but it has laden the environment with increasing effluents, pollution, levels of CO₂, global warming, depleting ozone layer, etc. Air borne emissions from various industries are cause of major concern. Indian cities are facing the high level of air pollution and residents of these cities pay the high price for it.

2.2 Reviews on Mining Industries in Rajasthan

As studied conducted by **Jha, Panwar, Khandelwal (2012)**, Kishangarh, Rajasthan is the biggest market for marble cutting and selling. Mining and over exploration and exploitation of water has deteriorated the quality and quantity of the water level. The Aravalli province constitutes the most important metallogenic province for base-metal deposits in India. Mining of minerals by surface method disturb the land from which it is mined and causes the land degradation and leaving the land infertile. Unplanned dumping of solid wastes from mines, indiscriminate disposal of mineral based industries, are also potential sources of land and landscape pollution. The stability of waste dumps is a burning issue because it threatens the working of the mine, degrades land and destroys the soil fertility.

Mining of natural resources is also considerable environment and pollution problems. Nowadays mining is posing threat to the eco-environment system. According to **Jha & Agarwal (2015)**, Mining operations whether it is open cast or underground, large or small, metallic or non-metallic, mechanized or non-mechanized, it creates considerable negative impacts on bio-geo-physical and social environment. The Important Environmental problems observed in marble mining areas are Land degradation, Deforestation, Soil contamination and Removal of Top-soil, Pollution of surface and groundwater, Mineral dust pollution, Noise pollution and vibration, Change in Land use, Change in hydro-geological conditions and Occupational health hazards.

According to **Mehta, Mehta (2015)**, Mining of minerals and marble extraction has been an ancient act carried out by mining people. Marble mining has become the need of the day. Mining is an ancient process which became popular with the passage of time. Large number of labourers are dependent on marble industries for their survival. The positive results were seen but the researchers soon realized the problems and drawbacks of much liked industries.

There are many problems associated with marble industry like ecological, environmental, sociological and pollutant hazard of the waste generated in mining. The study states the aspects of the research area and has found various ways for waste minimization.

2.3 Reviews of Occupational Health and Safety in Mining Sector of India and Rajasthan:

According to **Stephens and Ahren (2001)**, Mining is one of the most hazardous businesses causing the more fatalities than any other occupation. Mining labour and health conditions are changing due to the impacts of globalization. Mining is male dominated profession and health & safety risk differs according to location, product and the product. Lead-Zinc-Copper mines will create a complex set off occupational disease. In some mines hazard doesn't come from the product but from the hazardous material used in the process. Exposure to asbestos is the most significant insurance claim in the world and is responsible for the collapse of major British insurance group.

ICMR Bulletin (2003), analyzed that workplace safety and health is the major factor in organizational effectiveness. There are many management frameworks to implement the cost effective OHS to prevent the workplace accidents and the proper health of workers. An ideal OHS management system must minimize the potential risks to health hazards and increase the productivity by reducing the direct and indirect costs related to accidents and increase the quality in product or services. Organizations OHS goals must be in consistent with the OHS policy. These goals must be periodically reviewed and changes in them must be communicated to employees and stakeholders.

According to **Agnihotram (2005)**, though labour oriented markets are changing to automation but the general awareness about the occupational safety and environmental hazards are not spread in the society. Workers are more likely to be affected by the danger of the high technology. There are very few professional agencies like NIOH and ITRC researching on asbestosis and asbestos related disease. Due to poor surveillance it is impossible to assess the occupational exposure. There is some awareness or implementation of safety after the Bhopal Gas Tragedy. Most of the industrial laws in India are only in papers not in reality.

Unsafe conditions in mines cause loss and injury to human lives, damage to property and interruption in production. Safety is paramount in mining environment. According to **Jain (2007)**, Indian mines have not been applying risk assessment to the desired degree. Some common risk assessment techniques are Preliminary Hazard Analysis (PHA), Failure Modes and Effects Analysis (FMEA), Hazard and Operability Studies (HAZOP), Fault-Tree Analysis (FTA), and Event-Tree Analysis (ETA). A Safety Management System (SMS) focuses on the traditional Occupational Health and Safety (OHS). Present conditions of mine environment and safety risk is at low.

It has been examined about the Environment and Health impacts of Anglogold Ashant's Company Limited which has both underground and surface method of mining for extraction of Gold. It has been analyzed by the **Yeboah (2008)** that due to land degradation and pollution affecting adverse effect on land fertilization and contamination of water with the toxic chemicals such as arsenic. These environmental problems turned into health problems with the increasing prevalence rate of diseases such as malaria, respiratory tract infections and skin diseases. It is been concluded that there should be measures undertaken in the form of re-afforestation, reviewing methods of operation and provision of alternative sources of drinking water reduce the environmental problem. It is recommended through Government to build hospitals, clinics, health posts within the communities and also started Health Education program.

According to **Pandita (2009)**, India has legislation on occupational health and safety for 50 years still regulatory authorities are inadequate even for the inspection of formal units. Millions of workers in informal sector are working without any safeguards. Safety and health has been accorded at low priority by the industry as well as government. Unsafe working conditions are the top most reason for the deaths and disabilities amongst the Indian workers and around 4 lakhs people die every year due to work related problems.

It has been examined about the health status of the mineworkers in 12 gypsum mines in Rajasthan. It was examined between miners and office staffs. It was analyzed the low rate of literacy in miners. There are some common diseases found in miners such as hypertension, diabetes, musculoskeletal morbidity and pulmonary impairment, which is higher in smokers statistically. It has been recommended through regular health checkups, health education, promoting the personal protective equipment, enforcing legal regulations **Nandi, Dhatrik, Chaterjee and Dhumne (2009)**.

Workplace health and safety hazards may turn out to be costly but they are preventable if taken right precautions. According to **Sprio (2010)**, it's important to assess which hazards are the most damaging to the business and

employees, some may pose serious threats to the workers. The most prominent hazard in mining is communicable disease it affects the large portion of workforce. Job hazards analysis and risk mapping can prevent many accidents at work. Workplace accidents can be reduced by educating employees, it doesn't cost a lot and it could be proper training, monthly journal or emails.

According to **Das and Singh (2011)**, mining is one of the most hazardous work environment. Miners are exposed to pollutants and toxicants in mining i.e. chromium, lead, mercury, cadmium etc. Chromite mine workers are constantly exposed to contaminated dust and water. workers in the chrome ore are more exposed to lung cancer than the rest of the population. Continuous inhalation of hexavalent chromium compounds increases the risk of lung cancer. 84.75% of deaths in the mining areas and 86.42% of deaths in the nearby industrial villages occurred due to chromite mine related diseases. Indian health and safety association and industries, of government and private sectors, are involved in progress to reduce the number of occupational health hazards due to mining. However, the existing gaps in health and safety, safety laws and actions can be developed in the standard or in short-term.

Prevention of harm is the core driver of management approaches to occupational health and safety. Leading and lagging indicators should be used to provide as much information about the status of occupational health and safety management and outcomes in the mining industry as possible. According to **International Council on Mining and Metals (ICMM) (2012)**, the use of leading indicators for occupational health management is even more complex than for safety, due not least to the time delay between the causal factor and the eventual outcome as ill health.

In India occupational health of workers is secured by various statutes and policies. Legislation must provide effective level of protection to workers working in hazardous environment. Health and safety is the essential responsibility of the employer but it has not got due attention though all the safety provisions are enshrined in the laws and policies. According to **Sriraman (2012)**, there is no department of government of India dealing with matters of occupational health and safety and there is need of an apex body. Majority of employed population i.e. 83% fell in unorganized sector where Factories Act, 1948 and Mines Act, 1952 are not effective and sufficient. Employee State Insurance Act, 1948 has recently been amended to cover unorganized sector.

Workers can be motivated and their productivity can be increased when there is hygienic workplace environment and sufficient health and medical safety. Health and medical provision will greatly reduce the labour turnover and absenteeism in workers and improves the efficiency in the organization. This also creates the permanent settled labour force. According to **TN, Khan, T and T (2013)**, the role of occupational health service must be essentially preventive. Its functions should be to identify occupational hazards and suggest measures for their control, detect occupational or other diseases and give initial treatment, render advice about the placement of people in suitable work, provide necessary advice relating to the supervision of conditions at work which may influence health and general sanitation and undertake the health education.

Muthuviknesh & Kumar (2014), stated that workplace safety is priority. The goals of occupational safety and health programs include fostering a safe and healthy work environment. Occupational health and safety is important due to moral, legal and financial reasons. It must be the duty of the organization to care of the employees and the persons who may be affected by the company undertaking that their life shall remain safe. In designing safety programs and good working environment the management should not compromise even with the smallest safety concept which may be costly to both management and the employees.

Only some of the industries in southern part of India are having the occupational health and safety management system out of which only few are strongly implementing it. According to **Zubar, Visagavel, Raja and Mohan (2014)**, these industries are in immediate need of implementing and maintaining a good health and safety to worker to improve the safety standards in these industries. The commitment from the top management is required to improve the existing conditions that will help in implementing safety and health in an organization.

According to **Tripathy (2014)**, occupational health and safety is neglected in developing countries and the informal workforce suffers the most. Occupational health program are underfinanced due to the lack of political interest. Due to insufficient policies and strategies, the plight of the occupational workers has gone unnoticed. Improved surveillance systems, stricter implementation of legislations, large scale clinical and epidemiological research and better educational opportunities are the need of the hour.

2.4 Reviews on Major Occupational Disease (Silicosis) in Mining Sector of India

According to **Donogue (2004)**, mining is the one of the important industrial sector in the world however progress has been made for the control of occupational health hazards but there remains room for further improvements. Traumatic injury is a significant problem and ranges from the trivial to the fatal. Fatal injury includes rock fall, fires, explosions, mobile equipment accidents, falls from height, entrapment and electrocution. Controlling noise has proven difficult in mining and noise-induced hearing loss remains common. Crystalline silica has long been a serious hazard in mining, with the risk of silicosis.

According to **Gupta (2008)**, Liberal globalization policies and rapid industrial growth has developed the new challenges in occupational health related issues. The numbers of chemical factories which are under hazardous category in India are more than 5000 and more than half a million workers are occupied. The major occupational diseases which are prevalent are silicosis, pneumoconiosis, pesticide poisoning, noise induced hearing loss, chemical and machinery accidents. Occupational diseases are grossly underreported in India as most of them occur in unorganized sector. Lacks of staff in concerned departments are the reasons for the underreporting and insufficient actions on the hazards.

It has been analyzed to assess the impact of silicosis, silico-tuberculosis, and tuberculosis on the health system of mineworkers. According to the **Roberts (2009)**, the aim is to found the health systems surveillance of the pneumoconiosis in former miners, and to fix the diagnostic and compensation systems under the occupational diseases in Mines and Works Act 78 of 1973 (ODMWA).

2.5 Reviews on Major Occupational Disease (Silicosis) in Mining Sector in Rajasthan

It has been reported that lack of sufficient facilities in India is due to the mass population. According to **Tyagi (2004)**, Thar Desert of Rajasthan in India is drought prone area and due to scarcity of water causes lose of livelihood, malnutrition and poor economy. There is also a high mortality rate in Rajasthan such as overwork during pregnancy, inadequate food and lack of sanitation. Children below the age of 15 are malnourished and suffering from various diseases like anemia, vitamin deficiency, due to low immunity in body is causing pulmonary tuberculosis, malaria and intestinal infections. There is a lack of health education among people, Central Health Education Bureau (CHEB) and number of NGO's are working on it.

According to the **Malik (2005)**, in Rajasthan, Silicosis is common in mineworkers, It develops when dust containing silica is inhaled into the lungs. It is the most fatal and main cause of death among mineworkers. The surveys have been conducted in the district of Rajasthan with the collaboration between Gramin Vikas Vigyan Samiti (GRAVIS) and Society of Participatory Research in Asia (PRIA) examined the high rate of silicosis among mineworkers. For this occupational Silicosis, under the Workmen Compensation Act 1923, The Rajasthan Silicosis Rules 1955 were established. The rules provided ample provisions.

It has been studied that HEDCON (Health, Environment and Development Consortium) has taken the responsibility to the cause of mineworkers who working in mines and don't get the basic facilities such as toilets, first-aid boxes, safety provisions, weekly offs. Most importantly **Sharma (2007)** analyzed that mineworkers have to work there everyday where dangerous mineral dust - laden air occurs which cause many lung diseases such as silicosis, tuberculosis (TB), silicotuberculosis and asthma. The prominent places where mining is carried out for sand stone, marble and slate are Jodhpur, Makrana, Udaipur and Karauli.

In 2006 HEDCON filed the report against the labour, medical and health, mines department in the Government of Rajasthan and Mines Safety Office in the high court which was accepted in 2007 and issue the notices to the Rajasthan Government to give an account of this matter and to take proper action.

According to **GRAVIS (Gramin Vikas Vigyan Samiti) (2010)**, the total miners in Rajasthan 37% are women miners. Female workers are paid less than male workers. Almost every woman in miners is employed as unskilled and irregular labour. Symptoms of Anemia were found in all women workers and 30% symptoms of silicosis were also found. The necessary preventions are not taken either due to awareness or lackadaisal attitude on the part of the mine owners. Due to the malnutrition and overwork from responsibilities at home, their immunity is weekend and they are more susceptible to other diseases. They also works in their pregnancy and none of the women were received any maternity benefits from the mine owners.

There are lots of opportunities and potential to work on the Women's Rights in Mines. A strong will and a long term advocacy efforts are required to make this change. There are many other areas where there is need to work on Women's Rights in India.

According to the **Chopra, Prakash, Bhansali, Mathur, Gupta (2012)**, Silicosis is a form of pneumoconiosis and causes from the inhalation of crystalline silica particles (size 0.5- 5 microns in diameter). Tuberculosis is also common infection of lung associated with silicosis and together it is known as Silicotuberculosis. The sand stone mines in Jodhpur, it has been analyzed that among 300 stone mine workers were found silico-tuberculosis with clinico- radiological evidence. All study has been done on males. The Prevalence of Tuberculosis in Silicotics has been found most common when compared to prevalence in general population hence all should use prophylactic measures.

According to the **Times of India (2014)**, the worst case of Silicosis was found in Kota, Rajasthan where 14 out of 14 mine workers confirmed positive. The higher rate of silicosis was identified by the Pneumoconiosis Board. The Rajasthan Silicosis Rules, 1955 was established by the State Government under the Workmen Compensation Act, 1923. The scope of the occupational diseases was broadened and pneumoconiosis, which covers silicosis or coal miners pneumoconiosis or asbestos or any of these diseases accompanied by pulmonary tuberculosis.

According to **(RSMM) Rajasthan State Mines and Minerals Limited (2014)**, Rajasthan is richest in mineral resources of non- ferrous like copper, lead and zinc, mica. The current study deals with EIA study for lignite mining in Giral, District Barmer, and Rajasthan found the environmental problems, which couldn't be operated with proper planning in mining. However, the problems are ascertained by EIA study such as air pollution during excavation or dumping of overburden, increased noise levels and vibrations, loss of valuable top soil, topographical changes, increase in traffic and adverse impact on ecology.

Mining has always been among the most hazardous of occupations and rapidly increasing demand for metal and minerals to meet the demand for growing infrastructure has greatly increased the importance of mining. According to **Ahmad (2015)**, The quarrying and crushing are carried out in many parts of India and majority of stone mines are unorganized. In Sorya village Karauli, health problem reported by most of the miners were TB, silicosis, chest pain, back pain, Cough and Musculoskeletal disorder. Some of miners reported about low vision and hearing loss too. Sandstone mining leads to Silicosis, TB and body pain and musculoskeletal disorder.

Other related literature of the study are:-

2.6 Asbestosis in India

According to the **Ramanathan, Subramanian (2001)**, India operating more than thirty mines currently. It is producing 2800 tons of asbestos every month and about 70% quantity has been imported from Canada. India produces very poor quality of asbestos. Asbestos mining exposing cancer and other related diseases to the people. Women's affected more as compare to males who generally working in mines. Employment in asbestos industries and mines was around 100,000. The direct contact with the asbestos products causes lung and breathing problem.

It has been conducted the impact on Asbestos mines by the abandoned mines and elusion of accountability in companies are engaged in asbestos mining. This report proposes to compare the state of Jeffery mine- Quebec, Canada- Mine of Roro Hills, Jharkhand- India and Woodsreef mine- New South Wales, Australia. It had made a complete ban on Asbestos mining and provides legal and medical remedy to the victims of occupational and non-occupational exposure to asbestos **Krishna (2013)**.

2.7 Asbestosis in Rajasthan

Asbestos mining has been banned in 1986 and closed lastly in 2005, but it is being operated illegally in Jhadole and risking the health of the workers. Due to the inhalation of asbestos fibers causes inflammation of lung disease called Asbestos. **Sengupta, Dutta, Kazan (2011)**, diagnosed a victim Ramlal, who is diagnosed Asbestosis but getting treatment for tuberculosis. Another victim Hakla, asked the ban on asbestos and compensation from companies or government but not even got proper diagnosis and treatment facilities. Besides this, many workers who have diagnosed asbestosis, government don't recognize them asbestosis patients. Laurie Kazan Allen from International

Ban Asbestos Secretariat, UK, said that if India continued to use asbestos in industry, thousands of people risked infection.

2.8 Scleroderma in India

According to the **Parks, Conrad, Cooper (1999)**, Silica dust has been analyzed the most dangerous risk factor to several systemic autoimmune diseases, such as scleroderma, rheumatoid arthritis, systemic lupus erythematosus and some small vessel vasculitides with renal involvement. Crystalline silica (quartz), richly found in sand, rock and soil. High level of silica dust can cause chronic inflammation and fibrosis in the lung and other organs. It has been analyzed that higher level of silica exposure in occupational groups have increased rate of autoimmune diseases compared to the expected rate of general population. Through the experimental studies it has been detected that silica is an auxiliary to nonspecifically enhance the immune response. It involves in a development of autoimmune diseases which breaks immune tolerance or initiate autoimmunity diseases.

Another disease, Scleroderma or Systemic Sclerosis (SSc) is a heterogeneous disorder characterized by fibrosis of the skin and internal organs, it exhibits in small artery and obliterative microvascular disease, oesophagus, respiratory tract and other target organs. Pulmonary involvement occurs as visceral complication of systemic sclerosis and has common cause of death. **Almedia MSTM (2012)** examined that Interstitial Lung Disease (ILD) pulmonary vascular disease, particularly Pulmonary Arterial Hypertension (PAH), are the common encountered lung diseases. Progression of SSc lung disease difficult to predict. Exertional dyspnea and dry cough are the most common symptom of SSc which involves pulmonary development. Unfortunately, systemic sclerosis can't be diagnosed until last stage especially in those who did not find signs of skin-hardening or subtle respiratory symptoms.

There are many occupational diseases but exposure to silica is the main cause of Scleroderma-like disorders. It has been analyzed in European countries and also in Japan and the United States that silicosis and systemic sclerosis has been existing in the same patient. According to the **Ganguly, Kumar, Samanta, Mitra, Kundu (2013)**, found silicosis-induced diffuse parenchymal lung disease and systemic sclerosis after exposure to silica dust in a 26 year old male who works at stone masonry mines.

2.9 Scleroderma in Rajasthan

It has been analyzed that the Systemic Sclerosis develops by the disorder of chronic multisystem, characterized by the thickening of the skin caused by accumulation of connective tissue, gastrointestinal tract, lung, heart and kidney. According to **Bainara and Arya (2013)**, silica dust exposure is recognized for the development of systemic sclerosis. It has been analyzed in a case of manual stone cutter which exposes silica dust since last 17 years and not diagnosed silicosis but found Scleroderma, feature of systemic sclerosis. Diagnosis of silica associated systemic sclerosis on the basis of detailed clinic-radiologically and immunologically.

SYNTHESIS

After the thorough review of available literature, it has been found that Occupational health is highly neglected in the developing countries due to competing social, economic and political challenges. Due to its natural resources, India is one of the most important developing countries in the world. The current burden of accumulated occupational diseases in India is estimated to be at around 18 million cases. Leigh et al. have estimated an annual incidence of occupational disease between 924,700 and 1,902,300 and 121,000 deaths in India. The major occupational diseases/morbidity of concern in India are silicosis, musculoskeletal injuries, coal workers' pneumoconiosis, chronic obstructive lung diseases, asbestosis, byssinosis, pesticide poisoning, and noise-induced hearing loss. However more than 90% of Indian labours are employed in unorganized sector, this informal workforce suffers the most in India from above diseases.

A healthy work environment is the most important assets of individuals, communities and countries. Due to the rapid economic growth and industrial progress in our country, it becomes important to provide imperative safety and health at the workplace.

Occupational Health and Safety plays an important role in the working of organizational goals. Though the organizations have been found more productive where good health and safety mechanism exist. OHSAS 18001 is

the sound solution of day-to-day increasing challenges facing by the organizations due to high injury and illness, lost work days, increasing occupational health and safety regulations, large penalties, rising workers compensation costs, costly medical claims, worker retention and employee satisfaction.

Many researchers have been conducted their studies on the various kind of diseases in the mining industries but there is demand of further study on the occupational health and safety in the Mining Industries. The proposed study tries to assessing the Occupational health hazards and safety measures used in mining industries of Southern Rajasthan. The proposed study differs from the early studies in many ways and enriches the existing literature.

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