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Occupational Safety and Health in Coal Fields of Balochistan, Pakistan

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Abstract

Coal, the black diamond, is the second and cheapest source of energy all over the world. Despite its economic importance and contribution to eradicating unemployment, mining causes health and safety issues if it is carried out using old and fangled methods. It has resulted in disasters several times. Considering these issues, this study identifies risk factors such as occupational safety and health in coal mining in the Mach and Sor-Range coal fields among Balochistan, Pakistan's six large coal fields. These fields have been producing coal on a massive scale for many decades. Though coal mining is helping out a large number of workers economically, it has caused several types of fatal injuries and even casualties. Among several reasons, unsafe and primitive methods are the main reason for disaster in the mining sector. The workers at coal fields lack all essential health and safety facilities; no type of training is ever conducted for the safety of workers. The untrained workers are transferring the old mining methods to the next generation. The absence of emergency cells, which are highly prone to accidents and diseases due to methane gases, coal mine collapse, and dust, makes the workers inside and the population living near the coal fields vulnerable.

Keywords: Coal Mining, Coal Dust, Safety And Health Hazards, Disaster, Vulnerability, Socio-Economic.

Introduction

Coal is being produced in all developed and underdeveloped countries, but the risk factors associated with mining are deficient in developed countries. There are two types of coal mining all over the globe: underground coal mining and surface coal mining. In most developing countries, former techniques are carried out (Sheikh and Arif, 1989). Now, the world uses underground coal gasification methods in industries for energy generation and heating. Large coal producers worldwide are now using such advanced methods. For example, China is working on 30 underground coal gasification projects, and India is also working on such

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plans. Many other coal-producing countries are researching and studying underground coal gasification, including the United States, Australia, South Africa, Indonesia, Japan, and Vietnam (Mahmood et al., 1991). Coal also employs a large number of people. According to one estimate by the World Coal Association, some 7 billion people are directly involved with coal mining, and some 7US$ billion was invested in coal mining in 2010.

None of the countries can deny the usage and significant role of coal as it is the second largest energy source in the world. South Africa, the United States, China and Kazakhstan use coal energy. Coal is also used in different industries, such as brick cling and domestic use. There are thousands of workers in the coal mines giving their precious lives while digging out the black hole a large number of workers lose their lives; a report was published in Daily Nation newspaper on March 3rd, 2015, that in Pakistan, hundreds of workers died in 150 explosions at coal fields due to the accumulation of Methane Gas during the last ten years, report published by ILO that after every fifteen (15) seconds a worker dies due to work-related diseases or accidents,153 workers get accidents and 2.3 million workers die due to unsafe working environment. Such incidents are common in developing and developed countries (Singh, 2008). The job-related diseases in developing countries are increasing issues that mostly erupt in disasters. Not only the risky environment is responsible for such disasters, but the employer, government and labor union are also accountable for the unhealthy and insecure working place (Singh, 2008).

The fatality rate due to disasters in developing countries is 90 times higher than in developed countries. Underground coal mining is the most hazardous job in the mining field. The accidents in underground coal mining are twice as expected in other mining. However, most cases are not reported in developing countries due to a lack of implementation of ILO labor laws and conventions (Azad et al., 2013). The country profile of Pakistan prepared by ILO reports that 7000 fatal accidents occur annually, in which 25000 deaths occur. Though article 37(e) clearly states the rights of the place ensure a human and secure working environment and does not allow the owners or contractors to violate the rights of laborers, due to weak implementation, accountability and transparency of laws, the rights of laborers are constantly being violated. The labor inspection and protection policies have been under process for the last ten years; since 2000, the Pakistan labor gazette has been postponed, and policymakers seem uninterested in filling the gaps. Due to these loopholes, the accident rate in Pakistan is 20.7 per 100,000 workers, which is higher than that of many developed countries. For instance, this rate is compared with that of the United Kingdom, which is as low as 0.55 per 100,000 workers (Akram et al., 2011).

Thousands of workers are attached to the mining sector in Pakistan, but the working conditions are worse, irrespective of the field, with coal mining being the worst of all. Because of safety steps, the coal fields cause significant death rates every year; the authorities have not been able to control these accidents because of physical and technical standards; the ILO has been assisting the government of Pakistan in promoting institutional mechanisms to deal with issues related to health and safety at work areas, the assistance from ILO was extended after the deadly accident at *Baldia* town Karachi in 2012. However, the labor policies of 2002 and 2010 narrate the provision of hazard-free and safe working conditions. With this background, this study analyzes the occupational safety and health conditions directly or indirectly associated with coal mining.

Objective of Research

- To find out the occupational safety and health hazards in coal fields.
- To find out the socio-economic conditions and problems of coal mine workers.
- To evaluate the legislation related to the safety and health of coal mine workers.
- To investigate the relationship between the accidents and safety tools used by coal mine workers,
- To identify the mining methods in Mach and Sorange coal fields.
- To find out about Child Labor and its causes in coal fields.

Theoretical / Conceptual Framework

The study has its conceptual or theoretical background while keeping in view the different theories related to the rights of labor or labor class, the social and economic life and the impact of different stakeholders on their social and economic life; the labor theory of value interlace by Karl Marx And his book the Das capital that mainly was predicted on the issues between owners means of production" Capitalists" and the power of labor or power of working or labor class, Marx's believed that labor or workers were the common characteristics which they were shared by all services and goods exchanged in the market, according to Marx's theory that was not possible for two types of goods to have an equal number of labor.

Further, Marx divided society into different classes and studied the impact of the economy on human thinking. The owners or capitalist class is constantly violating the labor class rights because the interests of the capitalist class are common laborers around the world face similar social, economic, health and safety

issues; however, the Gold smith theory of "The nation's wealth" also describes the problems which the owners create in the shape of wealth. However, Immanuel Wallerstein's "World Social System" theory focuses on states' rights and how developed nations violate the rights of underdeveloped nations. He divides the countries into peripheral, semi-peripheral and core status.

The world is divided into two major economic systems, socialism and capitalism; however, as compared to socialism, capitalism is followed by the majority of countries around the world. Theoretically, this study focuses on workers' rights, health and safety, and fundamental rights, including educational and economic rights. The coal fields are located in areas where the societies are primarily tribal and feudalist societies, where the violation of rights of the working class is common, and where the labor class is a refugee or living far from their homes.

Limitation of Research

The target area or universe is very mountainous and not easy to access. The scattered population of the coal fields is situated in different and complex regions, and most of the workers belong to other provinces, especially KPK and Afghanistan. At Mach and Sorange Coal fields, the workers mostly live near the coal fields, which means the workers don't live in one specific area. The workers spend 10 to 12 hours in coal fields, and after coming out from the coal fields, they get tired and cannot provide enough time to participate in data collection. However, the study has limited time to be completed, and the financial problems can never be ignored because the study needs a lot of money to be conducted. Still, the researcher is enthusiastic and eager to complete the study accordingly.

Literature Review

Occupational safety and health is one of the most significant services. The efficient and effective occupational safety and health measures in mining sectors can reduce the risk of accidents and the injury and loss of lives of workers in the mining sector. Though the hazards in the mining sector cannot be fully mitigated, they can be reduced while implementing occupational safety and health policies and techniques Soni, K., & Vyas, N. (2015).

In the proposed study, the general literature includes the occupational safety and health in mining in Pakistan and neighboring countries such as India, China and Afghanistan, but also a broad perspective of the world because mining is being carried out all around the world, mainly in USA, UK and African countries, the literature would be viewed to get sufficient knowledge and literature on safety methods applied in mining, the risk factors and the mining tools which are being applied in mines now and in the past as well, the literature will also focus on social

and economic conditions of workers, the mining acts primarily in the context of coal mining, in Pakistan and Baluchistan province mainly,

In order to boost up the understanding on the any issue or topic the literature related to that plays vital role in order to identify the indicators in study, but the specific literature related to occupational safety and health in the context of Baluchistan is not much sufficient , because of low trends towards topic and mostly on target or focused areas where it is much needed, literature is available on bounded labor but also primary literature is in the shape of rapid assessment, print and electronic media reports on the occasion of accidents in the coal fields, but research studies or articles related explicitly to mines in Baluchistan, in order to explore the different views on topic a researcher needs sufficient literature, but enough literature can be found if we focus it on globally, however the literature review reveals different issues such as unsafe methods, health hazards, unhealthy and unsafe tools which are being used in coal mining sector, legislations related to mining sector.

The current literature on occupational safety and health rules and regulations is very significant for understanding the concepts of occupational safety and health. It has been discussed in different papers and articles that there is a high ratio of accidents in coal fields, and the workers of small groups in mining face enormous difficulties while fulfilling the occupational safety and health demands, Walle, M., & Jennings, N. (2001). Though mining is an old occupation long documented as complex and prone to diseases and injuries, the history of mining, especially coal mining, which consists of explosions in mines, shows mining is a multidisciplinary industry. There are several types of serious threats found in a field. Investigating the work details or functions is essential to ensure epidemiological and clinical tasks, as the terms miner or mining are comparatively nonspecific. Mining is often categorized as coal or metalliferous and underground or surface; metalliferous mining can also be categorized according to the product being mined. Several types of occupational health and safety issues are related to these mining methods, such as hearing loss noise-induced and respiratory diseases Donoghue, A. M. (2004).

Research Methodology

This study will include quantitative and qualitative mixed research methods because issues and problems related to the economy and health need mixed methods to be investigated. There are 38 coal fields at Sorange and 58 at Tehsil Mach. The area would be divided into clusters to acquire data; convenient Simple Random Sampling methods for collecting data. The workers spend significant time inside the coal fields, so the researcher uses convenient sampling methods. The mines department doesn't have data on workers, and the contractors hire workers;

however, it is estimated that 25 to 40 workers are in each coalfield .400 respondents would be interviewed for data collecting, 200 respondents from each.

Data Collection

The universe of study is Mach and Sor-Range coal mine workers. These mine workers could be divided into three strata based on their working environment. First, they were the mine workers most vulnerable to accidents and diseases. The second group of workers were more technical and operated the movement of trolleys, and the third group of workers were outside the mines, filling and loading coal sacks. Thus, a sample size of 400 coal mine workers was selected using the stratified sampling technique. Modes of data collection in this study were face-to-face interviews, questionnaires, focus group discussions, key informant interviews and observations. A survey was conducted before completing data collection to get the researcher, who supervised the survey, acquainted with the study area and to collect information required for designing the research. The questionnaires were administered to each miner. Before the survey, the questionnaire structure was pre-tested on 15 mine workers from the study area and checked for possible flaws and inconsistencies, after which the ambiguous and unclear questions were revised to get maximum information.

Research Hypotheses

1. Occupational safety and health hazards are standard in coal fields.

2. The workers are facing several social and economic issues.

3. The accidents are due to a lack of legislation concerning occupational safety and health in coal fields.

4. The accidents are likely to be related to mining techniques.

Results and Discussion

Coal Mining in Balochistan

Coal mining has a long history in Balochistan but was used domestically. Only surface coal mining was carried out, but later on, underground coal mining was initiated in the British era because coal was needed for transportation, primarily for rail engines, which were being run with the help of coal. Coal mining in Balochistan was initially started at *Tehsil* Duki. Still, later on, the British government discovered more coal fields, and there were three major coal fields that the British government was mining.

There are six developed coal fields in Balochistan located at Sor-Range Degari, Chamalang, Duki, Sharig, Mach-Abegum and Margat coal fields. According to the Geological Survey of Pakistan (GSP), the coal reserves in Balochistan are about 217 million tons (Mushtaq et al., 2012). These coal fields are located in far-flung areas lacking basic facilities of life such as roads, health services and drinking water. Due to old and primitive methods, coal mining has been causing several disasters. The workers lack all the essential safety tools, which makes them vulnerable to several diseases. The wastewater being exhausted by the coal mine is also a significant reason for skin and viral diseases. Most often, the coal mine collapses, which causes twenty to twenty-five deaths just in Sor-Range coal fields. Similarly, the piousness and explosive gases cause massive human loss in fields.

Safety Tools Used by Coal Mine Workers.

The lack of safety tools has been a major issue in the coal fields of the study areas, where most workers were found shirtless. They lack all the basic facilities related to their safety, and it is also a fact that without safety kits, the workers are prone to many physical, mental and psychological threats. The following table shows the percentage of safety tools coal mine workers use at Mach coal fields.

Table 1: Safety tools/kits used by coal mine workers

Safety Kits	Frequency	Percent	Valid Percent	Cumulative Percent
No	400	100.0	100.0	100.0
Total	400	100.0	100.0	

Table 1 shows the percentage of workers using safety tools and indicates they do not have essential safety tools such as face masks. Only a negligible number of workers have gloves; however, none use safety tools like helmets, uniforms, safety shoes and safety glasses.

The Coal Mine Act 1923 declares the safety tools, and according to the act, the owner or contractor must provide safety tools/kits to the workers. The workers have never been offered such tools. As mentioned above, most workers are found inside the coal mine with nothing related to their safety.

Accidents at Coal Fields

Due to the unavailability of safety tools, workers face several types of accidents in coal fields. The workers inside the mine need to use modern technologies to protect themselves. However, the workers had to manage safety and security themselves; no other stakeholders supported them. Table 2 shows the ratio of accidents in coal fields in the study area.

Table 2: Frequency of accidents experienced by mine workers

Accidents while Mining	Frequency	Percent	Valid Percent	Cumulative Percent
Yes	105	26.3	26.3	26.3
No	295	73.8	73.8	100.0
Total	400	100.0	100.0	

Over one-fourth of workers have gone through different types of minor or major accidents. As one of the workers describes,

"…after facing accidents inside or outside the coal mine, there is no type of financial support neither for us nor for our families. In many cases, we become physically disabled and remain a burden on our families…"

There is no emergency response for the workers in case of any emergency or accident, whether minor or significant. The workers are taken to Quetta city or Sibi consulting private hospitals for treatment and bear all the expenses alone, as Mach and Degari towns lack most health facilities.

Table 3 shows the type of accidents that occur during coal mining in the study area.

Type of Accidents	Frequency	Percent	Valid Percent	Cumulative Percent
Mine Collapsed	12	3.0	11.4	11.4
Stone/ Rocks fell Down	64	16.0	61.0	72.4
Electricity Shock	14	3.5	13.3	85.7
Fell From Track	15	3.8	14.3	100.0
Total	105	26.3	100.0	

It was found that nearly two-thirds of workers who have ever met with an accident have faced falling of stones or rocks, which are most common. According to them, they have gone through significant injuries due to the falling of stones. This was followed by the collapse of mines resulting from primitive methods and the unavailability of explosive gas detectors inside mines. Mining near railway lines and road crossings in the British era was banned due to vibrations created by crossing the train, but now the coal fields are mainly located near the railway line, which can be disastrous at any time.

Gas detection is done locally, as described by one of the respondents;

"We send a caged bird inside the coal mine with the help of a trolley. If the bird faints or dies, it means the coal mine cannot be mined, while if the bird was still alive, it means the mine can be worked in…"

While checking out the explosive gases in such methods, a large number of respondents have lost their lives or have been disabled. The unavailability of a proper ventilation system triggers this factor, as the respondents often suffer due to lack of oxygen. When workers faint due to poisonous gases, they are treated with locally available "Vinegar" to recover their breathing.

Diseases Faced by Mine Workers

Unsafe or primitive methods of coal mining are not the only issues related to coal mine workers; the unsafe working environment is another major issue at the study sites. The respondents are prone to many health issues due to unhealthy working conditions caused by coal mining or coal dust and the viral diseases caused by wastewater drained during mining, bringing impurities and chemicals into the open environment. Table 4 highlights diseases that are most commonly found among the respondents. The majority (more than one-fourth) of the respondents suffer from lung and ENT-related diseases, followed by more than one-fifth suffering from malaria and a good number having fever. Old mining methods and a lack of safety measures cause these diseases. New technologies and the availability of safety tools can reduce diseases. Many respondents mentioned that introducing a new drilling system for mining with the help of air pressure is very noisy inside the mine, which causes many respondents to have hearing problems. As mentioned, the respondents lack face masks; consequently, lung and chest issues are common among them.

Table 4 shows the frequency of common diseases among the respondents.

Common Diseases	Frequency	Percent	Cumulative Percent
Cough	106	26.5	26.5
Malaria	89	22.3	48.8
Joint Pain	20	5.0	53.8
Body Pain	24	6.0	59.8
Chest Pain	10	2.5	62.3
E&T	22	5.5	67.8
Back Bone pain	14	3.5	71.3
Cough/E&T	7	1.8	73.0
E&T and Malaria	1	0.3	73.3
Fever	49	12.3	85.5
Don't know	48	12.0	97.5
Blood pressure	7	1.8	99.3
Hepatitis	3	0.8	100.0
Total	400	100.0	

These are not the only reasons for bad working environments at workplaces. The mining methods, such as the coal being mined without any support, at Mach coal fields, mines that are just like rat holes are available. The workers bring coal while toiling. A few years back, such a mine collapsed, which resulted in the death of several mine workers. The workers in the coal fields of Balochistan are not even aware of the basic rights given to them by law or by ILO. The following table shows how the workers mine inside the black hole. The majority of the mines have no proper lighting system. Even one-fourth of the workers use charged lights on their foreheads**.**

Table 5 shows the frequency of the lightning system inside the coal mines.

Lightning System	Frequency	Percent	Valid Percent	Cumulative Percent
Electricity	106	26.5	26.5	26.5
Solar System	55	13.8	13.8	40.3
Power Generator	140	35.0	35.0	75.3
Charged Lights	99	24.8	24.8	100.0
Total	400	100.0	100.0	

It was observed that coal mining in Balochistan has no proper or modern system of mining, there is no such a modern system exist in coal mining for communication from inside to haulage (a person operates a machine to pull out the trolly)

Table 6 shows the frequency of communication systems inside the coalmines.

Communication System	Frequency	Percent	Valid Percent	Cumulative Percent
Intercom	125	31.3	31.3	31.3
Ringing bell	194	48.5	48.5	79.8
Rope Bell	81	20.3	20.3	100.0
Total	400	100.0	100.0	

Conclusion and Recommendations

Despite its economic importance and contribution to eradicating unemployment, coal mining is the most hazardous job around the globe, especially in developing countries where old and primitive methods are being used for mining. This paper aimed to assess workers' occupational safety and health conditions at Mach and Sor-Range coal fields. Living under unhuman and miserable conditions, the respondents and their children had no access to health and education facilities. They had to face extreme weather in mountainous areas where mining was being carried out. The respondents' homes were made up of mud and stones, lacking bathrooms and washrooms, causing many diseases. The coal mine workers must be provided residential facilities where they can live in one place, and health and educational facilities to be provided to workers and their family members. Living near the coal fields, the workers were facing many issues related to their health and hygiene.

The respondents were not trained and had no safety kits. Mines were supported by wooden pillars, which were neither safe nor could hold such huge and heavy weights. Falling of stones and rocks was another reason that mostly caused injuries to respondents. The departments must train the workers to learn new or modern mining techniques, which can prevent many disasters. At the same time, they might also be trained in first aid. Due to the unavailability of safety kits and face masks, the respondents were not only physically vulnerable but also prone to many diseases, as coal mining is the most hazardous work that needs the full attention of responsible authorities. The government agencies or departments must bind the owners/contractors/ operators to provide safety kits and training to the workers. Safety kits, including "face mask, gloves, helmet and uniform," must be provided to the workers who can save the workers from minor injuries. The ratio of minor accidents is very high in Mach coal fields.

New mining technologies must be used in the coal fields while replacing old methods of ventilation systems. Drilling methods and detecting hazardous gases must be improved to protect workers' lives. The drilling methods used in the study area were the main cause of coal dust in coal fields. The coal was being dumped in open environments near the population, which was causing several chronic lung cardiac diseases and TB. Despite such risks, the study area was lacking basic health facilities. Hospitals and healthcare centers were not available near coal fields. In case of serious injuries or death, the workers were not provided with health insurance facilities either by the government or by contractors/owners.

The labor inspection must be improved. It is just a bureaucratic exercise due to bad governance, capacity and lack of resources. The occupational health and safety services or systems are not established yet, and there is a lack of qualified human resources and basic infrastructure that provides a healthy and safe working environment. The labor policies of 2010 were still not implemented. There must be

awareness sessions regarding workers' rights, and the concerned department must educate the workers so they can know their basic rights given by the 1923 act or by ILO. The concerned department, including the Provincial Disaster Management Authority (PDMA), must establish rescue and emergency centers for the workers. The concerned authorities must regularly visit the coal fields to ensure mine workers' safety.

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