Master of Science in Public Health

Occupational Health and Safety among Coal Mine Workers Union Council Kurez District Orakzai, Khyber Pakhtunkhwa

By

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This dissertation is the result of an independent investigation. Where my work is indebted to others, I have made acknowledgments.

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This thesis is dedicated to my beloved parents and my supportive family...

ABSTRACT

Background: Occupational accidents are characterized as unexpected, undesirable events in the workplace that result in or have the potential to cause unintended harm or significant injury to the body.

Objectives: This study was aimed to assess the knowledge of occupational health and safety among coal mine workers and its association with demographic variables in UC Kuraiz, district Orakzai, Pakistan.

Methodology: A cross-sectional study was carried at UC Kuraiz, district Orakzai, Pakistan. A total of 303 coal mine workers were selected through non-probability purposive sampling for data collection. Data regarding assessment of occupational health and safety among coal mine workers was collected using a validated tool. Data were entered and analyzed using SPSS version 26.0. Pearson Chi-square test of Independence was applied to find out the assessment of occupational health and safety among coal mine workers.

Results: Results of the study showed that among 303 respondents, majority of them were from age group >50 years (n=113, 35.61%) and belong to the single marital status (n=180, 40%). A significant number were primary pass (n=110, 36.30%) and had a monthly income of 20000 (n=105, 34.65%). The majority of respondents had been employed in the mine for the past two years (n=115, 37.95%). Notably, the results revealed a poor awareness among coal mine workers regarding occupational health and safety was (n=173, 57.09%). Physical examination of mostly workers exhibited blood pressure readings range from 120-80 (n=130, 42.90%) and majority of them have respiratory issues (n=120, 60%). The study

also demonstrated that years of working in mine and place of work were statistically significant (p-value=0.000) with assessment of occupational health and safety among coal mine workers. Others demographic variables like marital and employment status, any clinical condition, number of workers working together were not statistically significant (p-value>0.05).

Conclusion: A recent study concluded that a significant number of coal mine workers demonstrated poor awareness of occupational health and safety. The study identified several socio-demographic factors such as age, educational background, workplace, and years of experience in the mine, which were significantly associated with the evaluation of occupational health and safety among coal mine workers.

Keywords: Coal Mine Workers, District Orakzai, Occupational Health, Safety, UC Kuraiz, Pakistan.

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In the name of Allah, the most Merciful and Beneficent

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My deepest gratitude to the coal mine workers who had spared their precious time and provided me required information for the completion of my study. I owe my supreme gratitude towards my parents for their unconditional love and support for me. They have always supported me in each and every phase of the life. Whatever I am and wherever I am, is just because of the altruistic love of my parents. Their prayers have made me strong enough to face every problem and difficulty of the life.

I would also like to extend my gratitude to my dearest friends, who owe me a big time for their support throughout my research work. I humbly thanks to all the persons who have supported me in this regard.

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LIST OF ABBERIVATIONS

CMM	Coal Mine Methane
CORE	Center of Risk, Safety, Health and Environment
ILO	International Labor Organization
IRB	Institutional Review Board
KAP	Knowledge, Attitude, and Practice
OHS	Occupational Health and Safety
OHSMF	Occupational Health and Safety Management Frameworks
OSALP	Occupational Safety and Loss Prevention
OTI	Occupational Training Institute
PPE	Personal Protective Equipment
PIM	Pakistan Institute of Management
PSI	Pakistan Safety Institute
STI	Safety Trends International
SPSS	Statistical Package for Social Sciences

CHAPTER I: INTRODUCTION

Coal primarily consists of carbon, accompanied by varying amounts of other elements like hydrogen, sulfur, oxygen, and nitrogen. Additionally, coal seams contain natural gases collectively referred to as Coal Mine Methane (CMM), primarily composed of methane with trace amounts of ethane, nitrogen, carbon dioxide, and other gases. Methane holds a dual nature, it can be viewed as an opportunity when extracted from coal beds as an energy source, yet it poses a threat due to its potential for explosions in mines and its contribution to global warming (Yao Y et al., 2009). As this gas stands as the primary culprit behind catastrophic incidents in coal mines, it becomes imperative to consider it throughout the entire process of coal exploration and extraction (Karacan et al., 2011).

The progression of economic and industrial activities is geared towards fulfilling human needs, with the aim of enhancing quality of life. Within this context, prioritizing safety becomes a crucial aspect in these detections. Mining stands out as one of the most dangerous industrial activities due to numerous hazardous incidents. Therefore, the assessment, management, and control of risks play essential roles in advancing safety standards in mines. Given the notorious reputation of underground mines, particularly in the case of coal mines, for their subpar occupational safety, conducting safety risk assessments becomes imperative (Saleh & Cummings, 2011).

Occupational accidents are characterized as unexpected, undesirable events in the workplace that result in or have the potential to cause unintended harm or significant injury to the body. Despite advancements in occupational safety standards, developing countries have

witnessed a rise in such incidents. Additionally, comprehensive information regarding occupational accidents is often lacking on a global scale, with many countries not consistently providing adequate data (Hamalainen P., 2009). As per the International Labour Organization (ILO), an estimated 2.78 million fatal occupational accidents or diseases occur each year. Additionally, approximately 374 million non-fatal work-related injuries and illnesses are reported annually, leading to work absences. The societal impact of occupational accidents encompasses direct, indirect, and concealed costs, with the economic burden surpassing $1.25 trillion per year (Hamalainen et al., 2017).

Among the five regions, Asia records the highest number of fatalities, with a rate of 12.7 per 100,000 workers. Africa follows closely with a rate of 16.6 per 100,000 workers. In contrast, Europe exhibits the lowest fatality rate among the regions, standing at 3.61 per 100,000 persons (International Labour Office (ILO), 2014). Workplace hazards often go unnoticed or are observed with less attention to their potential danger. Many developing countries have implemented various safety regulatory systems to reduce the occurrence of accidents. Government organizations such as OSHA in the USA and the Hong Kong Labor Department are consistently working towards achieving a 0% casualty rate. Additionally, numerous safety incentive programs are regularly promoted to decrease the frequency of accidents (Choudhry et al., 2008). In contrast, safety is not much properly considered in underdeveloping countries, such as Pakistan. Accident statistics are neither maintained nor regularly reported to the Government department (Raheem et al., 2016).

1.1. Rationale:

Insufficient awareness and a lack of education regarding hazards in coal mines are linked to occupational health and safety challenges. Addressing this crucial issue requires a collaborative effort involving occupational health and safety organizations, public health officials, coal mine administrations, and policymakers.

Numerous studies worldwide have investigated into occupational health and safety, aiming to uncover critical aspects of this matter. In Pakistan, existing literature predominantly focuses on musculoskeletal and respiratory issues, along with their related risk factors in coal mine workers. However, there is a noticeable scarcity of literature spotlighting the assessment of occupational health and safety among coal mine workers.

In response to this gap, the present study was undertaken to assess the occupational health and safety conditions among coal mine workers in UC Kurez district Orakzai, Pakistan. The findings of this study will contribute to the existing literature, shedding light on areas that require interventions to enhance knowledge and awareness of occupational health and safety among coal mine workers. These results will serve as a strong foundation for future research endeavors and evidence-based interventions, ultimately leading to improved occupational health and safety among coal mine workers in the region.

1.2. Objectives:

1. To assess the occupational health and safety among coal mine workers in Union Council Kuraiz district Orakzai, Khyber Pakhtunkhwa.

2. To determine the association of occupational health and safety among coal mine workers with their sociodemographic variables.

CHAPTER II: LITERATURE REVIEW

2.1. Context:

The safety attitude of employees mirrors their beliefs and sentiments regarding safety policies, procedures, and practices. Safety behavior, on the other hand, pertains to the actions individuals take to enhance the health and safety of their work environment (Lee et al., 2017). The Knowledge, Attitude, and Practice (KAP) model serve as an ideal framework for understanding behavior change, suggesting that individuals with a positive safety attitude also exhibit commendable safety behavior. A positive safety attitude can have a lasting impact on miners, subtly enhancing safety behavior and contributing to sustained improvements in safety practices (Lu et al., 2016).

Figure 1: Safety as a First Priority at Work Place

2.2. International, Global and National Studies Conducted on Occupational Health and Safety (OHS):

Suxia et al. conducted research in 2020. It was a cross-sectional study. This study investigates the mediating role of safety knowledge in the causal link between Occupational Health and Safety Management Frameworks (OHSMF) and occurrences of occupational injuries and workplace accidents within the Oil and Gas Industry in Ghana. The study involved a sample of 699 respondents, selected using a combination of convenience and purposive sampling techniques. These participants were drawn from three government-owned organizations in the oil and gas sector. The findings reveal a moderately strong negative and statistically significant correlation between Occupational Health and Safety Management Frameworks (OHSMF) and incidents of workplace accidents and occupational injuries. Importantly, safety knowledge emerges as a significant mediator in the causal connection between OHSMF and the occurrence of workplace accidents and injuries. Furthermore, safety training stands out as a significant predictor, influencing safety knowledge, work-related injuries, and workplace accidents. The observed negative correlation between OHSMF and workplace accidents and injuries recommend that the current frameworks may be either ineffective or fail to meet the necessary safety standards for controlling hazard exposures in the industry (Suxia et al., 2020).

Another study was conducted by Yuanlong et al. in 2019. The objective of the study was to assess the influence of safety attitudes on safety behaviors and explore the relationships among four distinct dimensions of safety attitude and two specific types of safety behavior. The impact of demographic characteristics including age, length of service, and education

level on safety attitude and safety behavior was also measured. The total of 593 respondents were included in the study. The findings indicate a modest association between age and length of service with safety attitudes, while education level did not exhibit a significant correlation with safety attitude. However, age, length of service, and education level showed no discernible impact on safety behavior (Yuanlong et al., 2019).

Shu et al. carried out a research in 2017. The study aimed to empirically assess the dimensions of external factors and investigate their impact on leadership safety behavior within the context of the mining industry. The total of 800 workers working in mine were selected for data collection. The study identified three dimensions of external factors: safety management mechanism, safety regulatory practice, and safety ideas. The study exposed a significant and positive impact of external factors on leadership safety behavior. Specifically, safety ideas have a significant and positive effect on leadership safety behavior. While safety regulatory practice and safety management mechanism show a positive influence, it is not statistically significant. Furthermore, safety regulatory practice significantly and positively affects safety training and safety policy within leadership safety behavior, while safety ideas significantly and positively influence safety training, safety management commitment, and safety incentives within leadership safety behavior (Shu et al., 2017).

Ahmad et al. conducted research in 2017. It was a cross-sectional study. he objective of this study was to evaluate the awareness of workplace hazards and the usage of personal protective equipment (PPE) among mineworkers. The total of 218 workers were selected for data collection. The findings of the study revealed that almost all respondents (93.6%)

demonstrated awareness of at least one hazard in the mining occupation, although none of them had received health and safety training within the past year. The recognized risks were predominantly injury (74.3%) and exposure to crystalline silica dust (40.4%). While a high percentage of mineworkers were aware of personal protective equipment (PPE) (87.6%), only 16.5% utilized PPEs during their employment, with the dust protective mask being the most mentioned. Instances of at least one occupational injury during work-life were associated with the use of dust masks, whereas work-related diseases correlated with a low level of education, being underweight, and current smoking. The study also found that awareness of workplace hazards was linked to age under 60, commencing work in mines at a young age (below 30 years), working less than 8 hours per day, and the absence of a drinking water facility. Failure to use PPEs at work was statistically significant and associated with belonging to scheduled castes or scheduled tribes, residing closer to the workplace (1–3 Km), working less than 8 hours per day, and the unavailability of safe drinking water (Absar Ahmad., 2017).

Another study was conducted by Joseph et al. in 2017. It was a cross-sectional study. The objective of this study was to evaluate the morbidity pattern among welders and assess their awareness of occupational hazards as well as their practices in using protective gears. A total of 155 respondents were selected. The findings of study showed a significant portion of welders (19.4%) reported working more than 8 hours a day. Overcrowding was observed at (10.3%) of the sites, inadequate ventilation at (6.9%), and the absence of exhaust ventilation at (25.9%) of the sites. About (62.6%) of welders demonstrated awareness of occupational health hazards associated with welding. The periodicity of medical examinations was found

to be associated with the awareness of occupational hazards among welders (p=0.032). First aid kits were present at (38.7%) of the sites. The most common morbidity reported over the past year was wounds (76.8%). Approximately (11.6%) of welders did not use essential protective gears such as face shields, masks, or eye goggles. The mean number of morbidities over the past month was higher among welders working continuously for ≥6 hours (p=0.05), at sites with overcrowding (p=0.002), and at sites where more than 10 welders worked together (p=0.031) (Joseph et al., 2017).

2.3. Safety Attitude:

The safety attitude of employees reflects their beliefs and emotions regarding safety policies, procedures, and practices (Burke et al., 2010). Promoting a strong safety attitude among coal mine workers is crucial for ensuring occupational health and safety. Following are some key principles and guidelines to foster a safety-oriented culture:

2.3.1. Risk Assessment:

- Conduct regular risk assessments to identify and mitigate potential hazards in the coal mining environment.
- Involve workers in the risk assessment process to gather insights from those on the frontline.

2.3.2. Personal Protective Equipment (PPE):

- Directive the use of appropriate PPE, such as helmets, gloves, respiratory protection, and safety boots.

- Regularly inspect and maintain PPE to ensure its effectiveness.

2.3.3. Emergency Preparedness:

- Develop and regularly review emergency response plans for various scenarios, including accidents, fires, and collapses.
- Conduct emergency drills to ensure workers are familiar with the procedures.

2.3.4. Community Engagement:

- Foster positive relationships with the local community, keeping them informed about safety measures and addressing concerns.
- Collaborate with regulatory bodies to ensure compliance with safety standards.

2.4. Safety Behavior:

Safety behavior is defined as individuals' behaviors to promote the health and safety of working environment (Lee et al., 2017). It includes a range of practices and habits that contribute to a secure and risk-aware workplace. Here are some key aspects and characteristics of safety behavior:

2.4.1. Team Collaboration:

- Collaborating with colleagues to create a culture of safety and mutual accountability

2.4.2. Communication:

- Engaging in effective communication regarding safety concerns with colleagues, supervisors, and management

2.4.3. Reporting:

- Reporting incidents, near misses, or unsafe conditions promptly to ensure timely corrective actions.

Figure 2: Occupational Health and Safety

2.5. Occupational Health and Safety (OHS) training institutes in Pakistan:

The 'Saeed Ahmed Awan Centre for Improvement of Working Conditions and Environment' is a prominent establishment in Lahore, located in the Punjab province of Pakistan. It stands as a leading center providing professional services in Occupational Health and Safety (OHS) as well as workplace environment improvement. This center was founded by the Labor & Human Resource Department of the Government of Punjab, Pakistan. Additionally, various private institutes in Pakistan offer OHS training services commercially.

1. Pakistan Institute of Management (PIM) has established its offices in Karachi, Lahore, Islamabad, and Quetta. It is awarding diploma certificates of OSH after four months of training.
2. Pakistan Safety Institute (PSI) is a Karachi-based commercial organization providing training, auditing, and consulting services in the field of health and safety, fire safety, and construction safety.
3. Occupational Safety and Loss Prevention (OSALP) is a Lahore-based commercial organization, providing training in the fields of quality assurance, health, safety, security, and environment.
4. Safety Trends International (STI) is a Karachi-based private institute providing NEBOSH and IOSH training.
5. DESCON, a well renowned Lahore and Karachi based company, is providing OSH training to its employees at its DESCON Technical Institute (DTI). They also provide training on a commercial basis.
6. Occupational Training Institute (OTI) is based in Lahore and providing OSH training on a commercial basis.
7. Vivid Institute of Occupational Safety and Health (VIOSH) has its training offices in eight cities of Pakistan. It provides OSH training courses like OSHA, IOSH, NEBOSH, particularly in the construction and petroleum sectors.
8. Horizon Institute of Occupational Safety and Health (HIOSH) has established its branches in Lahore, Rawalpindi, Attock and Peshawar. It is providing training for IOSH and NEBOSH certifications.

9. Center of Risk, Safety, Health and Environment (CORE) is a Karachi based institute, providing training for NEBOSH International General Certification and for IOSH Managing Safely and IOSH Working Safely certifications.

2.6. Dimensions of Occupational Health:

2.6.1. Continuous Increase of Psychosocial Problems:

Psychosocial problems, often identified as risks, have been recognized for over 30 years, prompting extensive research to comprehend their effects on health, explore their origins, understand their nature, and devise strategies for prevention or elimination. These problems are associated with issues such as absence, high turnover rates, depression, suicides and a decline in the quality and performance of enterprises (Eurofound, 2016).

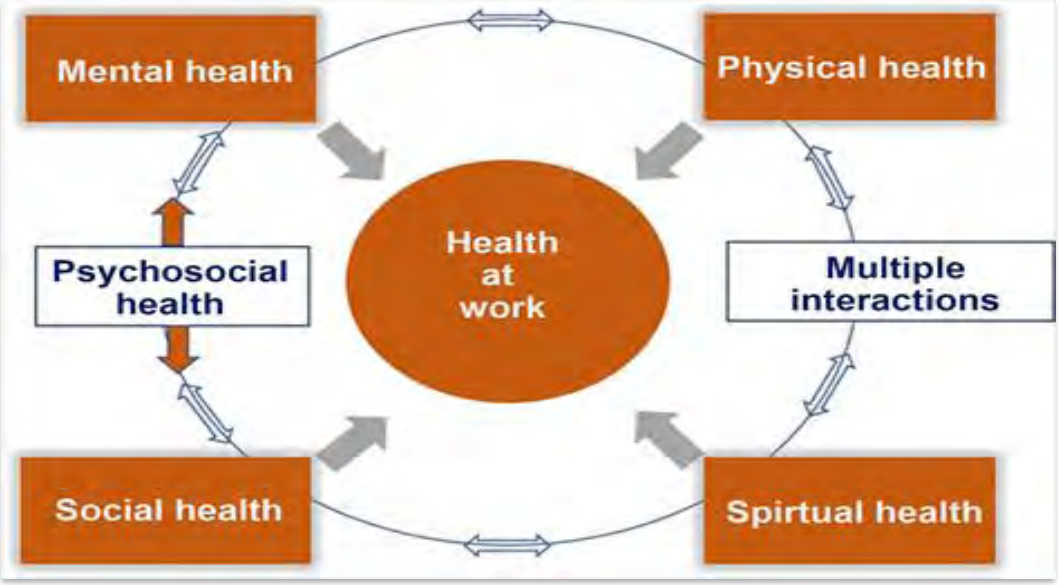

Figure 3: Occupational Health at Work

2.6.2. Continuous Increase of Social Inequalities:

Similarly, despite the improvement in living conditions and the favorable economic situation in many developed countries, social inequalities are on the rise rather than diminishing. The gap between the highest and lowest earners continues to widen, along with disparities in life expectancy between individuals in higher and lower social classes. This suggests that those in lower social classes, where working conditions are often less favorable than for their counterparts in higher classes, do not experience any enhancement in the quality of their lives (Ryder G., 2018).

2.6.3. Obvious Lack of Awareness about Economic and Social Stakes:

The direct and indirect costs associated with Occupational Safety and Health Problems pose a substantial economic burden on society. Despite being largely underestimated due to the often-hidden nature of occupational diseases, these costs surpass those attributed to conditions such as cancer, diabetes, and coronary heart diseases.

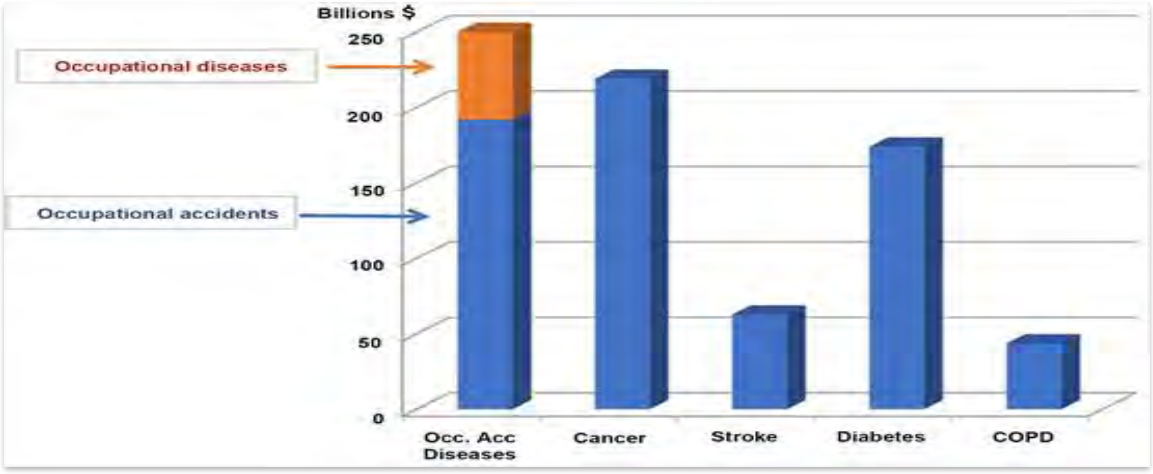

Figure 4: Occupational Diseases

2.7. Conceptual Framework:

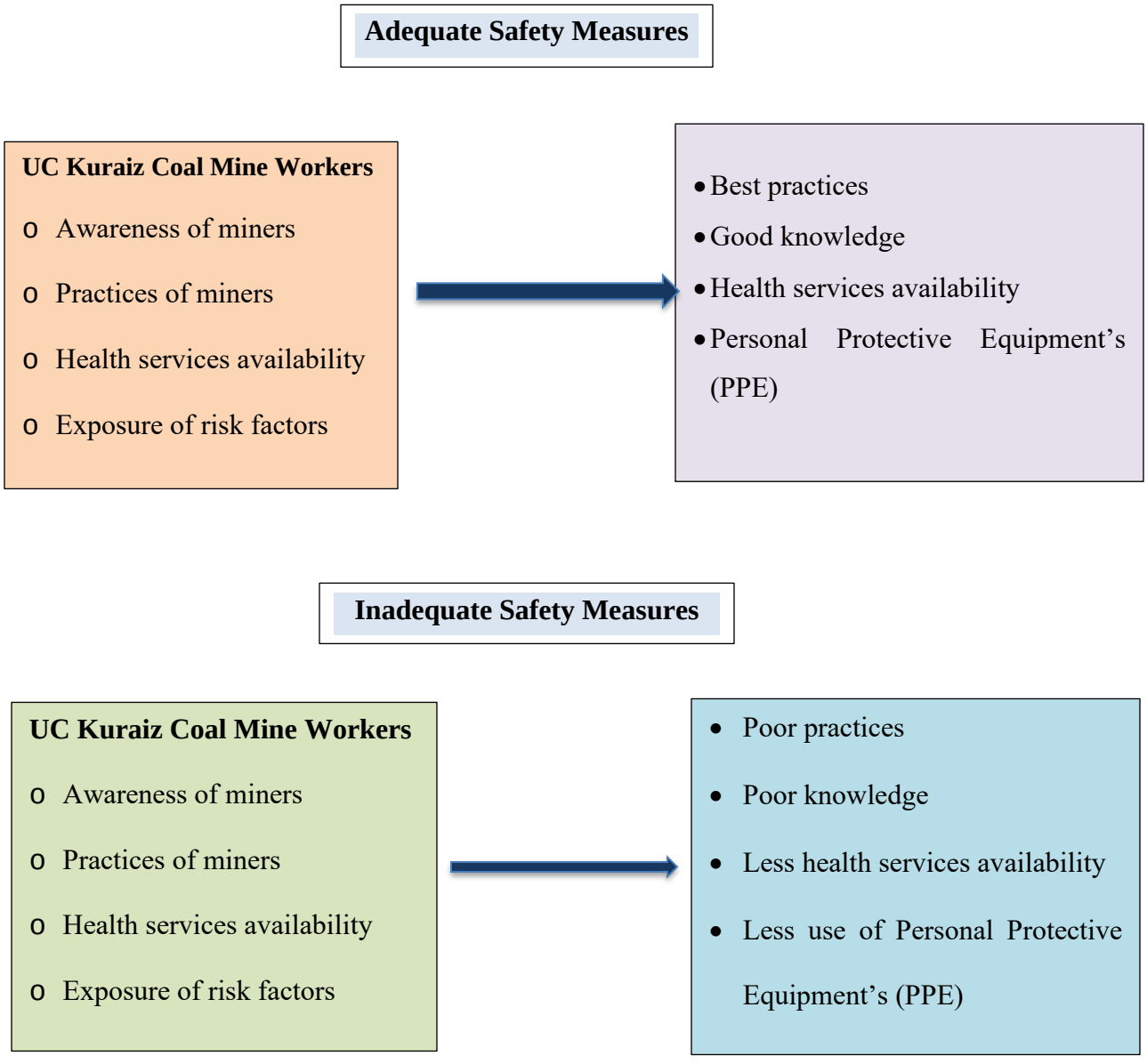

Figure 5: Conceptual Framework of Occupational Health and Safety

2.8. Operational Definitions:

2.8.1. Occupational Health and Safety:

Occupational safety and health are recognized as the field focused on preventing work-related injuries and illnesses, along with safeguarding and enhancing the overall health of workers.

2.8.2. Risk Management:

Risk management is an ongoing process that involves identifying, analyzing, evaluating, and addressing potential loss exposures. This includes monitoring risk control measures and financial resources to mitigate the adverse effects of potential losses.

2.8.3. Workplace Hazards:

Workplace hazards are the origins of potential harm or damage to individuals or objects within any work environment. These hazards can take the form of materials or activities that, under specific conditions, have the potential to cause injuries.

2.8.4. Control Measures:

Actions taken to eliminate or minimize hazards and reduce the associated risks. Control measures may include engineering controls, administrative controls, and personal protective equipment (PPE).

2.8.5. Emergency Preparedness:

The process of planning, organizing, and implementing measures to effectively respond to emergencies such as fires, chemical spills, or natural disasters in the workplace.

2.8.6. Hazard Identification:

The process of recognizing and documenting hazards in the workplace. This involves inspection, observation, consultation with workers, and review of incident reports.

CHAPTER III: METHODOLOGY

3.1 Study design

A quantitative research approach using cross-sectional study design was used for the current study.

3.2. Study Duration:

Study period for the current research was six months from September 2023-February 2024.

3.3. Study Population:

The study was carried out at coal mines of Union Council Kurez District Orakzai, Khyber Pakhtunkhwa. There is total 25 coal mines in Union Council Kurez and 1500-2000 coal mine workers are working there.

3.4. Study Participants:

Coal mine workers of Union Council Kurez were included in the study.

3.4.1. Inclusion Criteria:

1. Coal mine workers who were working for full time and also less than 1 years.
2. Workers with the age >20 years were included.

3.4.2. Exclusion Criteria:

1. Workers who have been employed for contract basis.

2. Administrative staff were also excluded.

3. Who were absent on the day of data collection.

3.5. Sample Size Calculation:

Sample size was calculated using proportion formula for sample size calculation in Open-Epi menu, Version 3.01 software. Previous prevalence of occupational health and safety was taken as 95% (Joseph et al., 2017). Calculated sample size was 303 with 73% confidence interval (C.I) and 5% margin of error.

Sample Size for Frequency in a Population

Population size(for finite population correction factor or fpc)(*N*):	1000000
Hypothesized % frequency of outcome factor in the population (*p*):	73%+/-5
Confidence limits as % of 100(absolute +/- %)(*d*):	5%
Design effect (for cluster surveys-*DEFF*):	1

Sample Size(*n*) for Various Confidence Levels

ConfidenceLevel(%)	Sample Size
95%	303
80%	130
90%	214
97%	372
99%	523
99.9%	853
99.99%	1193

Equation

Sample size $n = [DEFF*Np(1-p)]/ [(d^2/Z^2_{1-\alpha/2}*(N-1)+p*(1-p)]$

Figure 6: Sample Size Calculation

3.6. Sampling Strategy:

Selection of coal mines were carried out using convenient sampling.

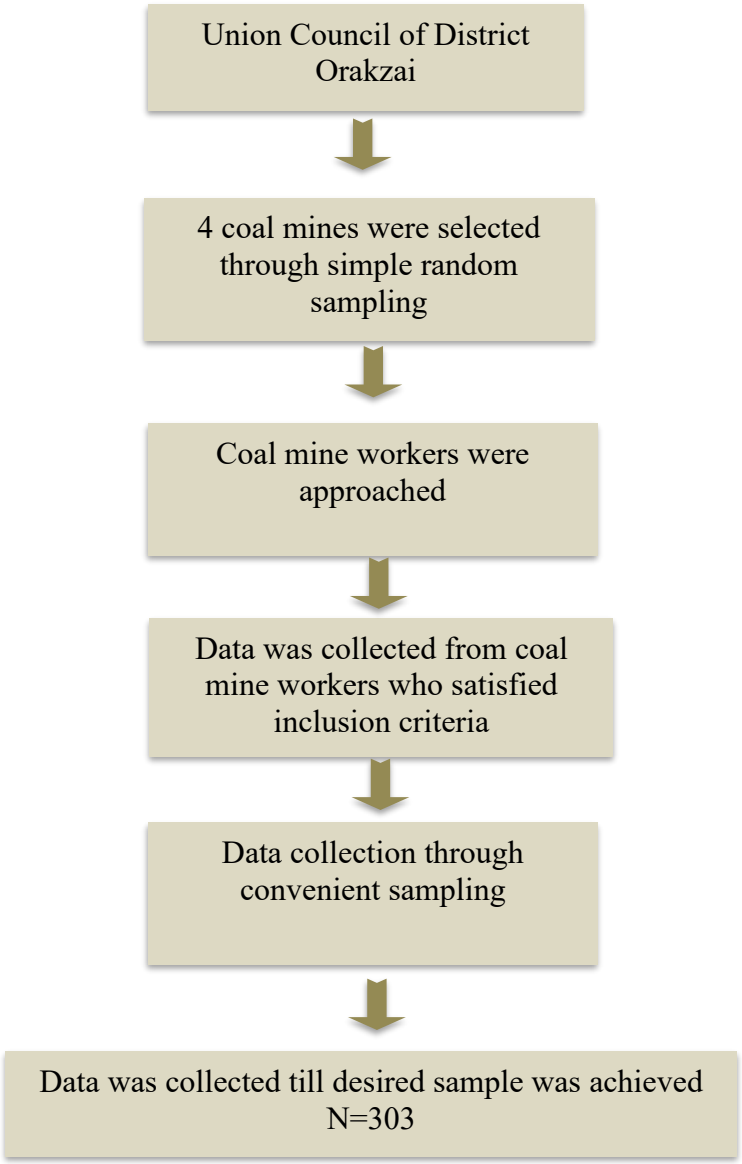

Figure 7: Convenient Sampling Strategy

3.7. Data Collection Tool:

3.7.1. Questionnaire Design:

Data was collected using an interview-administered questionnaire. A Performa was developed to collect data regarding sociodemographic characters of the respondents and assessment of occupational health and safety among coal mine workers. Questionnaire was adapted from a previous study (Joseph et al., 2017).

3.7.2. Content of the Questionnaire:

The questionnaire consisted of two sections:

1. **Section 1** included questions related to Sociodemographic characteristics of the respondents such as age, monthly income etc. This section contained a total of 12 questions.

2. **Section 2** included Physical examination of coal mine workers including their blood pressure measurement, history of any disease and nutrition level. Nutrition level was measured by using calf circumference. Scores of calf circumference from 12-14 were considered well-nourished, 8-11 indicated at risk of mild-malnutrition and 0-7 indicated sever-malnutrition.

3. **Section 3** included assessment of occupational health and safety among coal mine workers. This section contained a total of twenty-two questions. Five-point likers scale was used from 1=never to 5=Always.

4. Questionnaire was adopted from previous study (Joseph et al., 2017).

3.7.3. Study Variables:

3.7.3.1. Outcome Variable:

Awareness about occupational health and safety among coal mine workers was taken as outcome variable in current study. It was assessed using adapted questionnaire.

3.7.3.2. Independent Variable:

Data on independent variables was collected through a structured Performa that is constructed after international and national literature review. The Performa included sociodemographic variables, risk assessment about occupational health and safety.

3.8. Data Collection Process:

3.8.1. Reliability of Tool:

Pilot testing was performed before starting the formal data collection procedure by including 10% of the actual sample size (n = 30). Performa was tested for any future changes. Reliability of the scale was checked through the value of Cronbach's alpha which after adjustments came to be 0.81.

Reliability Statistics

Cronbach's Alpha	N of Items
0.81	22

Figure 8: Reliability of assessment of occupational health and safety

3.8.2. Data Collection:

All the coal mine workers of Uc Kurez, district Orakzai were approached. Consent was taken from the workers and they were informed about the purpose of the research. Only those were selected who agreed to take part in the research process and fulfill the inclusion criteria. After taking the consent, the respondents were interviewed and their responses were recorded by the researcher. Data collection was completed in approximately one month.

3.9. Data Analysis Procedure:

Code book was developed and data was entered in Statistical Package for Social Sciences (SPSS) version 26. After careful data entry, data was checked for any error before proceeding to the further analysis.

3.9.1. Data Cleaning:

After careful data entry, data was checked for any missing values and any error that could possibly affect the further analysis. Double entries were eliminated before continuing the further analysis.

3.9.2. Data Transformation:

Computed response was calculated for each respondent by adding the individual responses in SPSS. Computed scores for all assessment domains were also calculated. Computed response of outcome variable was calculated for each respondent by adding the individual responses in SPSS. Continuous variables were categorized in order to proceed the analysis.

Computed score was further categorized into poor and good levels taking median as cutoff point.

3.10. Descriptive Analysis:

Descriptive statistics were generated for sociodemographic characteristics and outcome variable. Data was summarized in the form of frequencies and percentages and presented in table form, Bar chart and Pie chart.

3.11. Inferential Analysis:

Pearson Chi Square test of Independence was used to determine the occupational health and safety among coal mine workers and socio-demographic characteristics of the respondents. P value less than 0.05 was considered statistically significant.

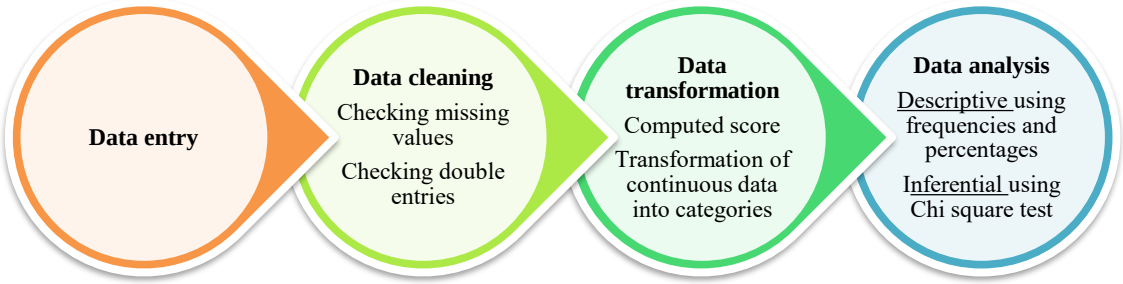

Figure 9: Data Analysis Plan

3.12. Ethical Considerations:

Before starting formal data collection, approval from Institutional Review Board (IRB) of Al-Shifa School of Public Health Rawalpindi, Pakistan has been taken. Permission letter from the Head of Department of Al-Shifa School of Public Health was obtained regarding access to the tertiary health facilities. Various public hospitals of Rawalpindi were approached for data collection. Permission was taken from hospitals for conducting research. Respondents were explained the purpose of the research and oral consent was taken from each participant before collecting the data. Data was collected from only those respondents who had agreed to participate in the research process voluntarily. Participants were assured for the confidentiality of their data. Data collected from the respondents was kept anonymous and was not shared with anyone. Data was entered in SPSS anonymously. After data entry, hard copies of collected were kept at a safe place.

CHAPTER IV: RESULTS

4.1 Sociodemographic Characteristics of Coal Mine Workers:

A total of 303 respondents were included in the study. Majority of them were from age group >50 (n=113, 35.61%) and belong to the single marital status (n=180, 59.40%). A significant number were primary level education (n=110, 36.30%) and had a monthly income of 20000 (n=105, 34.65%). The majority of respondents had been employed in the mine for the less than one year (n=115, 37.95%). Table 1 provides a summary of sociodemographic variables for coal mine workers.

Table 1: Sociodemographic Variables of Coal Mine Workers

S. No	Variable	Frequency (n)	Percentage (%)
1.	**Age**		
	o 20-35	80	26.40
	o 36-50	110	36.30
	o >50	113	37.29
2.	**Marital status**		
	o Single	180	59.40
	o Married	123	40.59
3.	**Education**		
	o Illiterate	90	29.70
	o Primary	110	36.30
	o Middle	50	16.50
	o Matric	53	17.49

4.	**Monthly income** o 20000 o 30000 o 40000 o >40000	 105 80 70 58	 34.65 26.40 23.10 19.14
5.	**Years of working in mine** o Less than 1 years o 1years o 2 years o More than 5 years	 115 80 70 38	 37.95 26.40 23.10 12.54
6.	**Employment status** o Full time o Part time o Contract	 120 95 88	 39.60 31.35 29.04
7.	**Any clinical condition** o Yes o No	 140 163	 46.20 53.79
8.	**Impact of clinical condition** o Very little o Slightly sever o Moderately sever o Extremely sever	 60 100 80 63	 19.80 33.00 26.40 20.79
9.	**Living in** o Mud house o Block house o Cemented house	 80 160 63	 26.40 52.80 20.79

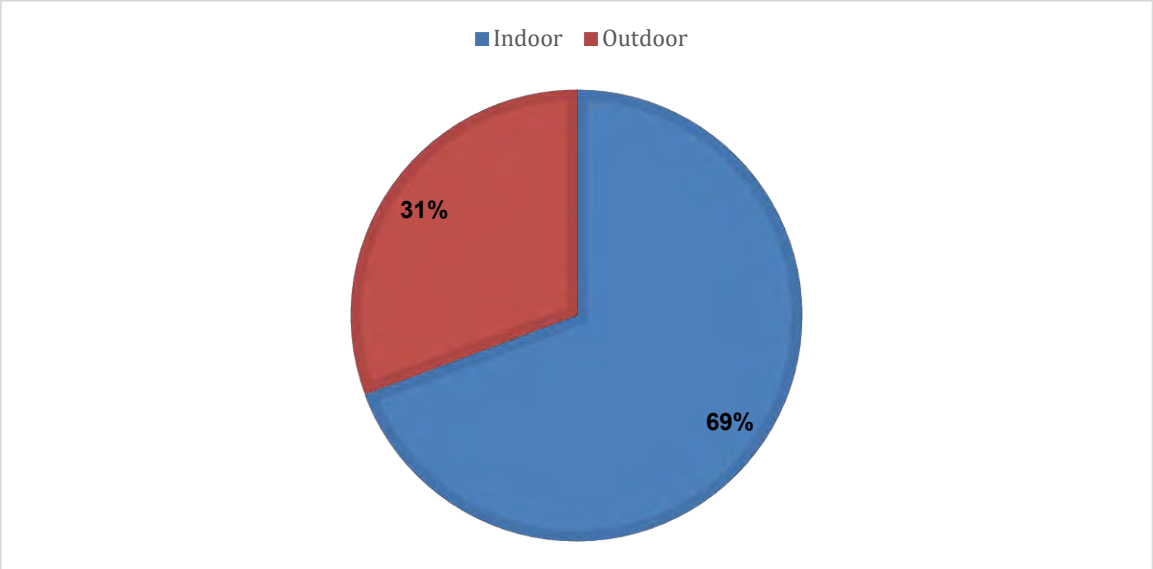

Figure 10: Place of Work of Coal Mine Workers

Findings of the study showed that majority of the workers were working at indoor place of mine (n=210, 69%) while (n=93, 31%) were working at outdoor place as given in figure10.

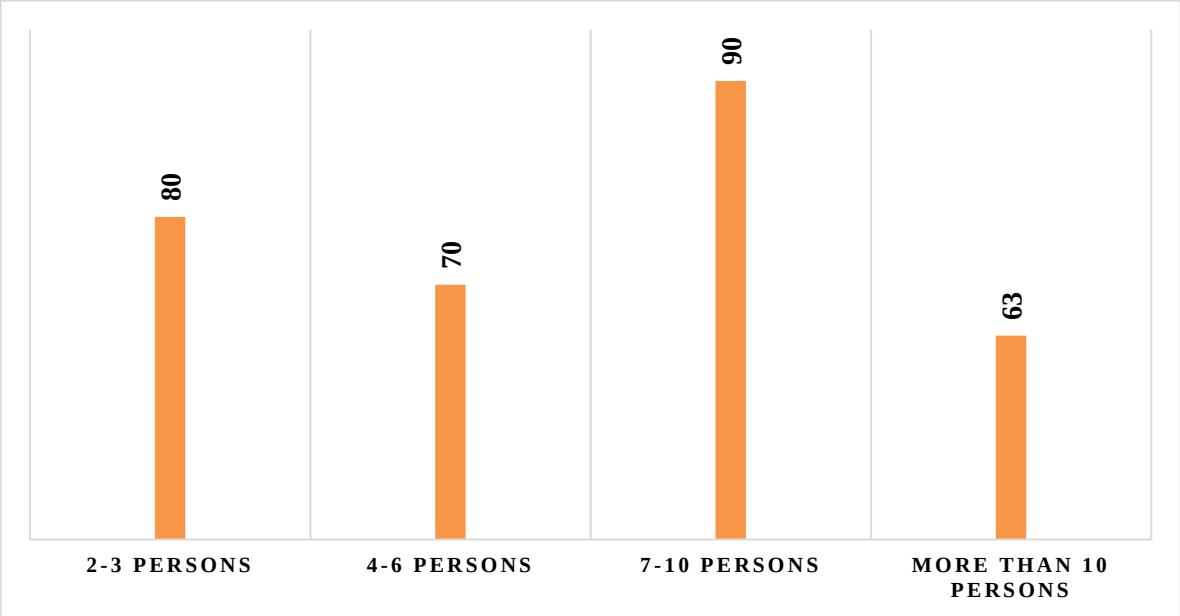

Figure 11: Number of Persons Working Together in Coal Mine

Results off the study showed that majority of workers were working with 7-10 persons in coal mine (n=90, 30%) as shown in figure 11.

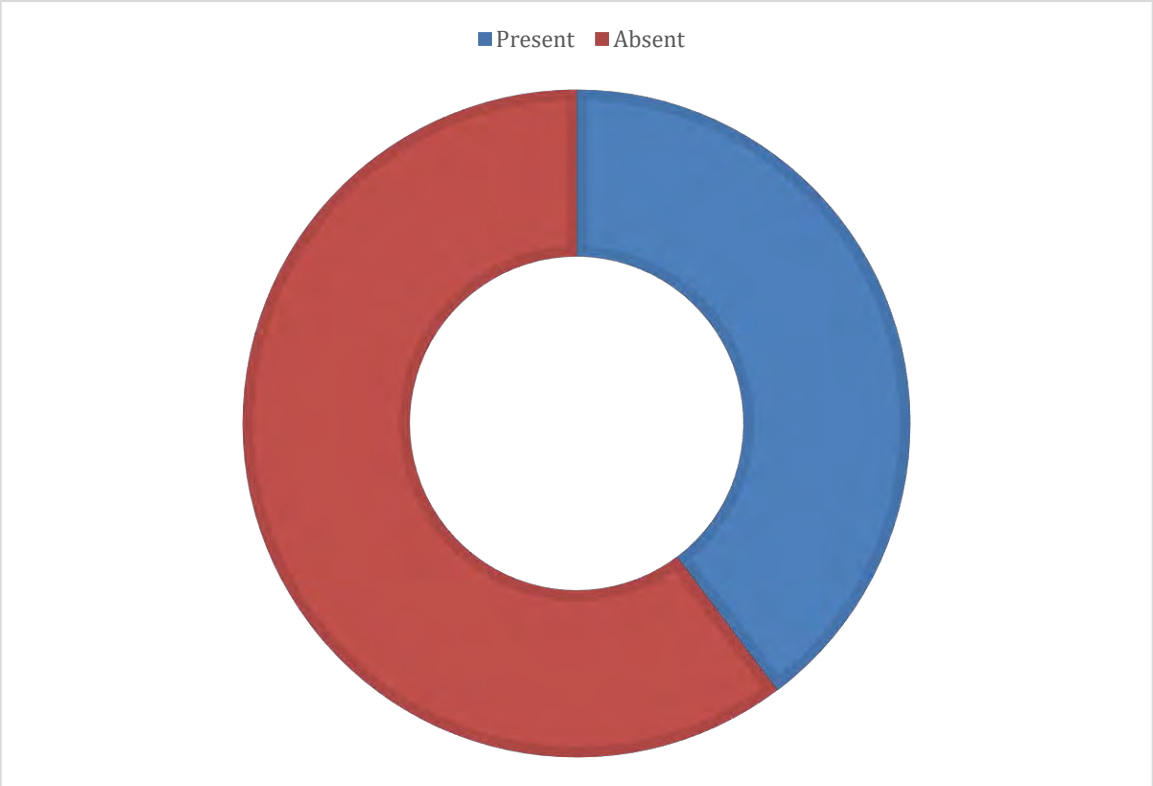

Figure 12: Exhausted Ventilation is Present in Mine

The study's findings indicated that a significant majority of workers (n=116, 38%) reported the absence of ventilation in the coal mine. The remaining participants indicated the presence of ventilation (n=187, 62%), as shown in Figure 12.

4.2. Physical Examination of Coal Mine Workers:

The study's results indicated that following a physical examination of coal mine workers, a substantial majority of them exhibited blood pressure readings within the range of 120-80 (n=130, 42.90%). Additionally, a considerable portion of the workers experienced respiratory issues (n=120, 39.60%), while a greater number were found to be well-nourished

(n=140, 46.20%). Table 2 presents a summary of the physical examination findings among coal mine workers.

Table 2: Physical Examination of Coal Mine Workers

S. No	Variable	Frequency (n)	Percentage (%)
1.	**Blood Pressure** • 120-80 • 140-100 • >140-100	 130 120 53	 42.90 39.60 17.49
2.	• **History of any Disease** • Heart problem • Kidney problem • Disease of liver • Respiratory Issues • Others	 60 50 23 120 50	 19.80 16.50 07.59 39.60 16.50
3.	**Nutrition Level** • Well nourished • Mild malnutrition • Severe malnutrition	 140 100 63	 46.20 33.00 20.79

4.3 Awareness about Occupational Health and Safety among Coal Mine Workers:

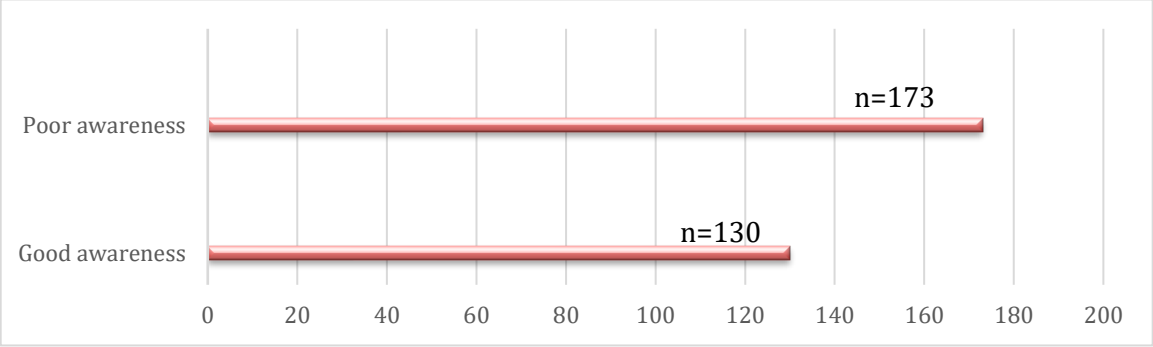

Figure 13: Awareness of Occupational Health and Safety among Workers

Findings of study revealed that majority of workers showed poor awareness regarding occupational health and safety (n=173, 57.09%).

4.4. Association of Awareness about Occupational Health and Safety among Coal Mine Workers:

The study's findings demonstrated a statistically significant association between the awareness of occupational health and safety among coal mine workers and the sociodemographic status of the respondents, with a p-value of < 0.05. The assessment of awareness, conducted using a 5-point Likert scale (1=Never, 2=Rarely, 3=Occasionally, 4=often, and 5=sometime), revealed noteworthy associations.

The study's results highlighted that awareness concerning occupational health and safety among coal mine workers revealed significant associations with variables such as age group (p-value=0.001), education level (p-value=0.007), years of working in the mine (p-value=0.000), place of work (p-value=0.000), and the presence of exhaust ventilation in the mine (p-value=0.041) as shown in table 2.

Table 3: Association of Awareness about Occupational Health and Safety with Sociodemographic Variables

Variables	Awareness of Occupational Health and Safety (n)		Chi-square (df)	P-value
	Poor	Good		
Age				
o 20-35	30	45	5.37	
o 36-50	70	90	(2)	**0.001***
o >50	55	13		
Marital status				
o Single	80	60	6.77	0.733
o Married	130	33	(1)	
Education				
o Illiterate	40	30		
o Primary	60	40		**0.007***

o Middle o Matric	50 40	30 08	25.98 (3)	
Monthly income o 20000 o 30000 o 40000 o >40000	 31 52 46 66	 35 20 30 33	 48.94 (3)	 0.087
Years of working in mine o Less than 1 years o 1years o 2 years o More than 5 years	 40 25 40 60	 25 55 25 33	 8.33 (3)	 **0.000***
Employment status o Full time o Part time o Contract	 60 70 82	 42 30 19	 6.77 (2)	 0.073
Any clinical condition o Yes o No	 130 90	 40 43	 6.47 (1)	 0.081
Impact of clinical condition o Very little o Slightly sever o Moderately sever o Extremely sever	 60 40 25 40	 55 20 25 38	 5.37 (3)	 0.078
Living in o Mud house o Block house	 82 70	 19 30	 7.99 (2)	 0.113

o Cemented house	60	42		
Place of work o Indoor o Outdoor	 108 90	 50 55	 4.52 (1)	 **0.000***
Number of persons working together o 2-3 o 4-6 o 7-10 o >10	 66 46 53 31	 33 30 20 35	 10.51 (3)	 0.213
Exhaust ventilation in mine o Present o Absent	 90 133	 50 30	 6.21 (1)	 **0.041***

CHAPTER V: DISCUSSION

Occupational health and safety issues are of considerable global concern. The primary objective of the current study was to evaluate the awareness of occupational health and safety among coal mine workers, analyzing a range of sociodemographic variables. The research was conducted at UC Kuraiz in the district of Orakzai, Pakistan.

Findings of the study revealed that age-group of coal mine workers was significantly associated with association of occupational health and safety among coal mine workers (p-value=0.001). It was noticed that majority of coal mine workers among age-group from 20-35 (n=29) was showing poor awareness about occupational health and safety. On the other hand, age-group >50 years was showing good awareness about occupational health and safety (n=26). This could be due to the fact that language barriers or communication gaps between management and workers can hinder the effective distribution of safety information. Certain coal mines, especially in economically disadvantaged regions, might face challenges in allocating resources for extensive health and safety programs.

In the present study it was also noted that education level was also significantly associated with association of occupational health and safety among coal mine workers (p-value=0.007). It was observed that those workers who were illiterate having poor awareness about occupational health and safety (n=29) as compared to other workers. These findings are similar with the previous studies. A study was conducted by Xue et al. in 2021. The purpose of this study was to investigate the effects of occupational stress and mental health on Musculoskeletal disorders (MSDs) in coal miners in, China. Results of the study showed that the prevalence of MSDs among coal miners was higher, and there were statistical

differences among educational level and monthly income ($P < 0.001$) (Xue et al., 2021). This could be due to the fact that geographical remoteness or economic challenges may limit access to quality education for individuals in coal mining communities. Irregular schedules and demanding physical labor may make it difficult for some workers to attend traditional educational institutions.

It was also observed that years of working in mine was statistically significant (p-value=0.000) with assessment of occupational health and safety among coal mine workers. Poor knowledge was assessed among majority of workers (n=28) who have been working from the last two years in coal mine. It may be due to the reason that some coal mining operations, especially in economically challenged regions, may face resource limitations. This can impact the availability of training materials, safety equipment, and the implementation of comprehensive safety programs.

In the current study it was also observed that place of work of coal mine workers was statistically significant (p-value=0.000) with assessment of occupational health and safety among coal mine workers. Those workers who were doing their work at indoor side of coal mine were showing poor knowledge in numbers about occupational health and safety as compared o others. This may be due to the reason that indoor environments may be perceived as less hazardous compared to outdoor mining activities. This perception might lead to a reduced emphasis on safety measures, and workers may underestimate the potential risks associated with their specific tasks. Some indoor mining operations may involve exposure to specific environmental hazards, such as poor air quality, dust, or fumes. Workers may not be adequately informed about the potential health risks associated with these factors. Indoor

mining operations may face resource constraints, affecting the availability of training materials, safety equipment, and qualified personnel to conduct OHS training.

In the current study, other sociodemographic variables such as marital status, monthly income, employment status, number of persons working together were not statistically significant with assessment of occupational health and safety among coal mine workers. It may be due to the reason that different employment statuses may be associated with varying levels of access to training programs. Full-time employees might receive more comprehensive and ongoing training, including regular updates on safety protocols, compared to temporary or contract workers. Contract workers, who may be hired for specific projects or periods, might not have the same sense of job security as permanent employees.

5.1. Strengths:

1. The study employed reliable and valid data collection methods to ensure accuracy.
2. A thorough and current literature review was taken into account for the present investigation.
3. The current study was an important step towards assessment of occupational health and safety among coal mine workers in UC Kuraiz, district Orakzai.

5.2. Limitations:

1. Small sample sizes may not accurately represent the diversity within a population.
2. Due to limitations in terms of time and resources, these constraints may impact the depth and breadth of the study, limiting the scope of the research questions that can be addressed.
3. Another potential limitation is the presence of information bias.

CHAPTER VI: CONCLUSION

The safety mindset of workers reflects their views and feelings towards safety policies, procedures, and practices. A recent study found that a notable portion of coal mine workers exhibited poor awareness about occupational health and safety. Various socio-demographic factors, including age, education level, workplace, and years of experience in the mine, were identified as significantly linked to the assessment of occupational health and safety among coal mine workers.

CHAPTER VII: FUTURE RECOMMENDATIONS

Based on the current findings, following recommendations are put forward.

7.1. Healthcare Dealing System Level:

1. Provide comprehensive training programs for healthcare workers focusing on occupational health and safety protocols.
2. Conduct regular risk assessments to identify potential hazards in the healthcare environment.
3. Prioritize mental health support for healthcare workers, who often face high levels of stress and burnout.

7.2. Health Policy Level:

1. Employers should be required to conduct regular risk assessments to identify potential hazards in the workplace.
2. Governments and employers should work together to promote a culture of safety in the workplace.
3. Employers should implement health surveillance programs to monitor the health of workers and detect early signs of work-related illnesses or injuries.

7.3. Individual/ Miner Level:

1. Utilization of wearable devices such as smartwatches and sensors can monitor vital signs, movement patterns, and environmental factors to alert individuals to potential hazards or risks in real-time.

2. Depending on the nature of the work, individuals should ensure they have access to and consistently wear appropriate PPE.
3. Fatigue can increase the risk of accidents and injuries. Individuals should schedule regular breaks during strenuous activities, adhere to recommended work-hour limits, and listen to their bodies to prevent burnout and exhaustion.
4. Actively seeking feedback from supervisors, colleagues, and safety professionals can help individuals identify areas for improvement in their safety practices.

References

(ILO), I. L. (2014). Safety and health at work: a vision for sustainable prevention. XX World Congress on Safety and Health at Work. Global Forum for Prevention. . 24-27.

Ahmad, A. (2017). Awareness of workplace hazards and preventive. *Journal of Health and Social Sciences, 2*(2), 69-82.

AM, S. J. (2011). Safety in the mining industry and the unfinished legacy of mining accidents: Safety levers and defense-in-depth for addressing mining hazards. *Safety Science, 49*, 764-77.

Burke, M., Sarpy, S., Tesluk, P., & Smith-Crowe, K. (2010). General safety performance: A test of a grounded theoretical model. *Pers. Psychol., 55*, 429–457.

Choudhry, R. M. (2008). Safety management in Construction:Best practices in Hong Kong. Journal of professional issues in engineering education and practice,. *134*(1), 20-32.

Eurofound. (2016). Sixième enquête européenne sur les conditions de travail—Rapport général. Synthèse.

Hämäläinen P, T. J. (2017). Global estimates of occupational accidents and work-related illnesses. . *Findlan: WHS Institute*.

Karacan CÖ, R. F. (2011). Coal mine methane: a review of capture and utilization practices with benefits to mining safety and to greenhouse gas reduction. *International Journal of Coal Geology, 86*.

Lee, H., Halim, H., Thong, K., & Chai, L. (2017). Assessment of Food Safety Knowledge, Attitude, Self-Reported Practices, and Microbiological Hand Hygiene of Food Handlers. *Int. J. Environ. Res. Pub. Health, 14*(14).

Lu, C.-S., Hsu, C.-N., & Lee, C.-H. (2016). The Impact of Seafarers' Perceptions of National Culture and Leadership on Safety Attitude and Safety Behavior in Dry Bulk Shipping. *Int. J. e-Navig. Marit. Econ., 4*, 75-87.

Nitin Joseph, V. V. (2017). Occupation Hazards – Pattern, Awareness and Preventive Measures among Welders from an Unorganized Sector in India. *Journal of Clinical and Diagnostic Research, 11*(5).

P., H. (2009). The effect of globalization on occupational accidents. *Saf Sci., 47*(6), 733–42.

Raheem, A. A. (2016). Safety implementation framework for Pakistani construction industry. . *Safety Science,, 82*, 301-314.

Ryder, G. (2018). Persistent and Growing Inequality Threatens Global Growth. Statement. 2018 Annual Meetings of the World Bank and the IMF, Washington, .

Shu Zhang, X. S. (2017). Measuring the effects of external factor on leadership safety behavior: Case study of mine enterprises in China. *Safety Science, 93*, 241-255.

Suxia Liu, E. N. (2020). The State of Occupational Health and Safety Management Frameworks (OHSMF) and Occupational Injuries and Accidents in the Ghanaian Oil and Gas Industry: Assessing the Mediating Role of Safety Knowledge. *BioMed Research International*.

Xue Li, X. Y. (2021). Associations of musculoskeletal disorders with occupational stress and mental health among coal miners in Xinjiang, China: a cross-sectional study. *BMC Public Health, 21*.

Yao Y, L. D. (2009). Preliminary evaluation of the coalbed methane production potential and its geological controls in the Weibei Coalfield Southeastern Ordos Basin, . *China. International Journal of Coal Geology, 78*, 1-15.

Yuanlong Li, X. W. (2019). Impact of Safety Attitude on the Safety Behavior of Coal Miners in China. *Sustainability, 11*(22).

Appendix A – Questionnaire

Occupational Health and Safety among Coal Mine Workers in Uc Kurez, District Orakzai, Pakistan.

Section-A (Sociodemographic)

1. **Age**

- 20-35
- 36-50
- >50

2. **Marital status**

- Single
- Married

3. **Education**

- Illiterate
- Primary
- Middle
- Matric

4. **Monthly Income**

- 20000
- 30000
- 40000
- >40000

5. **Years of working in mine**

- Less than 1 years
- 1years
- 2 years
- More than 5 years

6. Employment status

- Full time
- Part time
- Contract

7. Any clinical condition

- Yes
- No

8. Impact of clinical condition

- Very little
- Slightly sever
- Moderately sever
- Extremely sever

9. Living in

- Mud house
- Block house
- Cemented house

10. Place of work

- Indoor

- Outdoor

11. Number of persons working together

- 2-3
- 4-6
- 7-10
- >10

12. Exhaust ventilation in mine

- Present
- Absent

Section-B (Assessment of Occupational Health & Safety Among Coal Mine Workers)

Questions	Never (1)	Rarely (2)	Occasionally (3)	Often (4)	Always (5)
1. Are you often tired?					
2. Are you often sleepy or restless?					
3. Do you regularly suffer from headaches?					
4. Do you regularly have problems concentrating?					
5. Do you have problem with your vision?					
6. Do you have pain in your shoulder, arm or hand?					
7. In your hip, leg or foot?					
8. In your neck?					
9. At the small of your back?					

10. Do you think that your work is highly physical?					
11. During your work, do you experience inconvenience by, lengthy standing?					
12. Lengthy period of working in same physical position?					
13. Bending down regularly?					
14. Lengthy period of repetitive movements?					
15. Do you think that your work is too difficult?					
16. Do you have any respiratory issue? Like cough, breathlessness etc.?					
17. Do you have any morbidity pattern? Like 18. Wounds, burns, pealing of skin etc.?					
19. Do you use any face shield during work?					
20. Any mask or eye glasses?					
21. Ear muffs?					
22. Boots and hand gloves?					

Thank you for your participation!

Appendix B – Consent Form

I am Syed Noor Ibrahim Shah, student of MSPH- Final Semester, Alshifa School of Public Health, Alshifa Eye Hospital, Rawalpindi. I am doing research on "Occupational health and safety among coal mine workers in Uc Kurez District Orakzai, Pakistan".

PURPOSE OF THE RESEARCH

The purpose of this study is to find out the assessment of occupational health and safety among coal mine workers in Uc Kurez District Orakzai, Pakistan.

PARTICIPATION

I do not anticipate that taking this study will contain any risk or inconvenience to you. Your participation is strictly voluntary and you may withdraw your participation at any time without penalty. I request you to answer the questions as honestly as possible. It will take no longer than 15 minutes to complete a questionnaire. All information collected will be used only for research purpose and will be kept highly confidential. Your identity and your responses will not be identifiable; all data will be stored anonymously. As this is solely a student project no incentive will be provided. Once study is completed, I would be happy to share the results with you if you desire.

Thank you for agreeing to participate in this study. Your feedback is important.

Consent

I have read and understand the information sheet and agree to take part in the study.

Signature_____ Date_____

Appendix C – IRB Letter

PAKISTAN INSTITUTE OF OPHTHALMOLOGY
AL-SHIFA SCHOOL OF PUBLIC HEALTH
AL-SHIFA TRUST, RAWALPINDI

MSPH (68)/18-14
2nd Oct, 2023

TO WHOM IT MAY CONCERN

This is to certify that **Syed Noor Ibrahim Shah** S/O **Syed Ibrahim Shah** is a student of Master of Science in Public Health (MSPH) final semester at Al-Shifa School of Public Health, PIO, Al-Shifa Trust Rawalpindi. He/she has to conduct a research project as part of curriculum & compulsory requirement for the award of degree by the Quaid-i-Azam University, Islamabad. His/her research topic, which has already been approved by the Institutional Review Board (IRB), is **"Occupational health and safety among coal mine workers Uc Kurez district Orakzai, Pakistan".**

Please provide his/her necessary help and support in completion of the research project. Thank you.

Sincerely,

Dr. Ayesha Babar Kawish
Head
Al-Shifa School of Public Health, PIO
Al-Shifa Trust, Rawalpindi

AL-SHIFA TRUST, JEHLUM ROAD, RAWALPINDI – PAKISTAN
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Appendix D – Budget

Budget item	**Transport**	**Stationery and internet**	**Printing**	**Publishing**
Pilot testing	**500 Rs/-**	**6000 Rs/-**	**3000 Rs/-**	**-**
Data collection	**8,000 Rs/-**	**8,000 Rs/-**	**-**	**-**
Thesis write-up	**1,000 Rs/-**	**9,000 Rs/-**	**6,000 Rs/-**	**20,000 Rs/-**
Total expenditure	**10,500 Rs/-**	**23,000 Rs/-**	**9,000 Rs/-**	**20,000 Rs/-**
Grand total	**61,500 Rs/-**			

Appendix E – Gantt Chart

Activities	September 2024	October 2023	November 2023	December 2023	January 2024	February 2024
Literature search						
Synopsis writing and IRBapproval						
Pilot testing						
Data collection and entry						
Data analysis						
Write-up						
Thesis submission						