

**A STUDY TO DETERMINE FACTORS
CONTRIBUTING TO MINE ACCIDENTS AT
ZCCM, MUFULIRA DIVISION**

BY

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SCHOOL OF MEDICINE
POST BASIC NURSING DEPARTMENT

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LIST OF ABBREVIATIONS

Z.C.C.M.	-	Zambia Consolidated Copper Mines
R.R.H.	-	Ronald Ross Hospital
I.L.O.	-	International Labour Organisation
W.H.O.	-	World Health Organisation
M.U.Z.	-	Mineworkers Union of Zambia
N.I.O.S.H.	-	National Institute of Occupational Safety and Health
O.S.H.A.	-	Occupational Safety and Health Administration
U.K.	-	United Kingdom
F.O.D.P.H.P.	-	Federal Office of Disease Prevention and Health Promotion.
U.T.H.	-	University Teaching Hospital
U.N.Z.A.	-	University of Zambia
1 - 3 Casualties	-	Sick off 1 - 3 days
MSD	-	4 days sick off and above

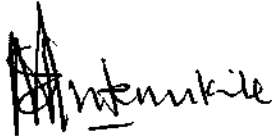
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DECLARATION

I hereby declare that the work presented in this study for Bachelor of Science Degree in Nursing has not been presented either wholly or in part for other Degree and is not being currently submitted for any other Degree.

SIGNED BY:

CANDIDATE

A handwritten signature in black ink, appearing to read "A. Munkile". The signature is written over a dotted line.

APPROVED BY:

SUPERVISING LECTURER

STATEMENT

I hereby certify that this project is entirely the result of my own independent study. The various sources to which I am indebted are clearly indicated in the text and in the references.

SIGNED: ?

CANDIDATE

DEDICATION

This research work is affectionately dedicated to my Dear Husband Sylvester Kansumba without whose love, prayers, patience, understanding, encouragement, spiritual and moral support my studies and this work would not have been possible.

To our lovely Sons Besa, Mwelwa, Chituka and Bupe who were denied motherly love at the time when they most needed it.

To my sister-in-laws Mwansa and Getrude for their love and devotion to the family without whom my studies would never have been done.

To my parents Pastor Tom Chituka and my mother Edina Chituka for their support and encouragement to the family and myself while at the University.

To my brothers Michael, Tom and Peter for their continued support in my studies at the University.

Lastly to my late sister Jane who encouraged me to pursue studies though she never lived to see me get the Degree Award.

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My sincere gratitude goes to the Management of Mufulira Division of Zambia Consolidated Copper Mines for granting me the opportunity to carry out the study.

I wish to thank the personnel at Accident Prevention Department, Mufulira Division for the assistance rendered during the administration of the questionnaires and for making it possible for me to tour the underground and the Surface Mine Plant Area.

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To them all I say, may the good Lord Richly Bless You.

ABSTRACT

Industrial accidents are extremely costly, whether measured in terms of medical expenses and disability compensation, lost production and wages or damage to plant and equipment. The human cost in death and suffering is beyond calculation. In recent years the costs of accidents have increased dramatically because of civil litigation and product liability suits have also increased.

The study was done at Mufulira Division of ZCCM between 28th August to 8th September, 1995. It was aimed at determining the contributing factors to mine accidents at Mufulira Mine plant area. The sample size was sixty (60) and the respondents were selected using the systematic random sampling method. A self administered questionnaire was chosen to be an ideal and appropriate instrument to obtain intended information from the respondents considering that, the respondents were able to read, write and understand the questions very well.

The specific research objectives were as follows:-

1. To determine whether the workers' Health and Safety Act is effective to deal with employers in the provision of adequate industrial Health and Safety Services.
2. To determine whether the Union/Professional organisation representatives are active in encouraging Health safety standards in industries.
3. To establish the employees attitudes towards the provision of physical and material resources, in the achievement of organizational goals.
4. To establish the employees attitude towards safety regulations in the industry.
5. To determine whether the working hours contribute to mine accidents.

The literature was obtained from studies done in Zambia and other countries all over the world on causes and prevention of industrial accidents.

The research findings revealed that some of the factors contributing to mine accidents were as follows:-

1. Negative attitude of employees;
2. Negative attitude of employers;
3. Lack of active professional associations - ZOOHS; and
4. Lack of active Union/Workers representatives.

It also revealed that most of the employees that were involved in Mine accidents were in the middle age class. There was also inadequate human and material resources leading to bad practices such as contravening the safety rules in some instances. This was also due to lack of supervision from their immediate supervisors. There was also a gap between the knowledge on safety rules and the carrying out of safety measures whilst on the job.

The information obtained makes the study relevant to ZCCM, Mufulira Division management. It is hoped that the findings will assist the management in formulation of policies in relation to improved working conditons and maintaining a health and safe workplace in the mining industry.

Therefore, it is hoped that the recommendations put forward to resolve the problems would be taken seriously by Mufulira management.

CHAPTER 1

INTRODUCTION

1.1. BACKGROUND INFORMATION

Zambia is a nation best known for its world class deposits and high quality output of copper, cobalt and for its diverse natural beauty. Its pleasant climate results from a tropical location in south Central Africa combining with an average elevation above 1 000m on the central plateau (Advertisement supplement to Mining Journal, October 9, 1992 Vol. 319 No.8194).

Zambia is divided into nine provinces namely Lusaka, Central, Southern, Western, Eastern, Northern, North Western, Luapula and the Copperbelt. The Copperbelt Province is the main area involved with the Mining Industry of the Zambia Consolidated Copper Mines (ZCCM).

ZCCM employs 61,433 people representing about 15 per cent of total paid employment in Zambia, making the company the second largest employer after the government (ZCCM Diary, 1994). Mufulira Mine alone employs 7,401 which is approximately 12 per cent of the Corporate total (Mufulira Division, monthly report on operations for the month of January, 1995).

The Company staff records at the Psychological Department show that three quarters of the employees work in the Mine Plant area and approximately 3,000 work underground. In the mining Industry most of the workers are exposed to

damp, dusty, noisy, less oxygen, hot working environment and usually work for long hours leading to fatigue. (Safety, Health and working conditions produced by the Joint Industrial Council in Sweden, 1987). The fatigue makes employees more prone to accidents.

Since these accidents can be fatal or minor, when they occur, they affect the Mining Industry in terms of production, profits and labour. For Mufulira Division accidents are thought/suspected to be due to these working environment.

For instance in December 1994, the Mine accidents that were attended to at Ronald Ross Hospital (RRH) were 37, these included both minor and casualties, some of them were hospitalised though there were no deaths for that particular month. While January 1995 had 29, February 20 and for the first eight (8) days of March were nine (9) accidents (Records Department RRH). This shows that workers are still being exposed to dangerous and varying degrees of occupational hazards though emphasis has been placed on promoting measures to provide health services for Industrial Workers. (Pinnagoda, 1992). Since the provision of health services for Industrial Workers have already been achieved to a large extent, the emphasis now should be on the reduction (if possible to zero) of Mine accidents.

1.2. STATEMENT OF THE PROBLEM

Although there is a safety policy (Health and Safety at work, Act 1974) in place, the Mining Industry still faces problems, Ideally safety services should

respond effectively and specifically to the most important work derived accidents of the working environment, thereby serving to improve the overall safety of the Industrial Workers (Occupational Health Services). This does not seem to be so in Zambia.

At the management quarterly meeting held in Mufulira on October 21 1994, the General Manager presented the vision statement as follows:- " We want to work as a team to be the safest, most efficient and cost effective Mine in ZCCM, working for the prosperity of shareholders and all employees". He repeated almost the same statement at the 9th Annual ZCCM Intermine Safety Quiz competition held at Mufulira on 24th February, 1995. One of the goals that he would like to see was drastic reduction in fatal accidents so as to ensure that life was not lost while in production. (Zambia Mining Industry Newspaper, March 1995 No.335). According to the General Manager's statements, this is a clear indication that accidents are a problem at Mufulira Division.

Nogueira (1987) in a study of Accidents Prevention in Brazil, noted that while combined public and private efforts in the industrialized south of the Country have led to significant reduction in accident rates, the incidence of serious injuries continue to be high.

This is what is also clearly noted that serious injuries at Mufulira Division remain high, according to a report compiled by Mufulira Accident Prevention Department in the last five years.

The figures of the fatal accidents were as follows:-

YEAR	NUMBER OF ACCIDENTS
1990	05
1991	02
1992	08
1993	04
1994	06

(Report by Accidents Prevention Department, March 1995).

With reference to General Manager's statement the implication is that fatal accidents are still high at Mfulira Division. As a result of these fatal accidents some families have suffered displacement and have been subjected to property grabbing. They have undergone emotional distress of not only losing a husband and a father but also a livelihood.

Parmeggiani (1989) in his analysis of Industrial Accidents costs stated that families are subjected to economic difficulties and that there is an overwhelming anxiety for the rest of the family and detriment to their future, especially in the case of children.

The other type of accidents that still remain high are the 1-3 shifts casualties. These were as follows:-

YEAR	NUMBER OF ACCIDENTS
1990	212
1991	233
1992	259
1993	264
1994	154

(Report by Accidents Prevention Department, March 1995).

The personnel that are being affected do play an important role in their families and in the Nation's economic development. So if this issue is left unattended to by management, the production level will drop drastically leading to lower profits in the industry. Parmeggiani (1989) in his assertion, indicated that workers who are the victims of accidents at work suffer from material consequences which include expenses and loss of earnings. This may be of short or long duration. He also admitted that considering the National economy, the interdependence of its members is such that the consequences of an accident affecting one individual will have repercussions upon others. And Rantanen (1990) postulated that the role played by a healthy and contented work force towards economic development can not be over emphasized or simplified.

The minor accidents reported were as follows:-

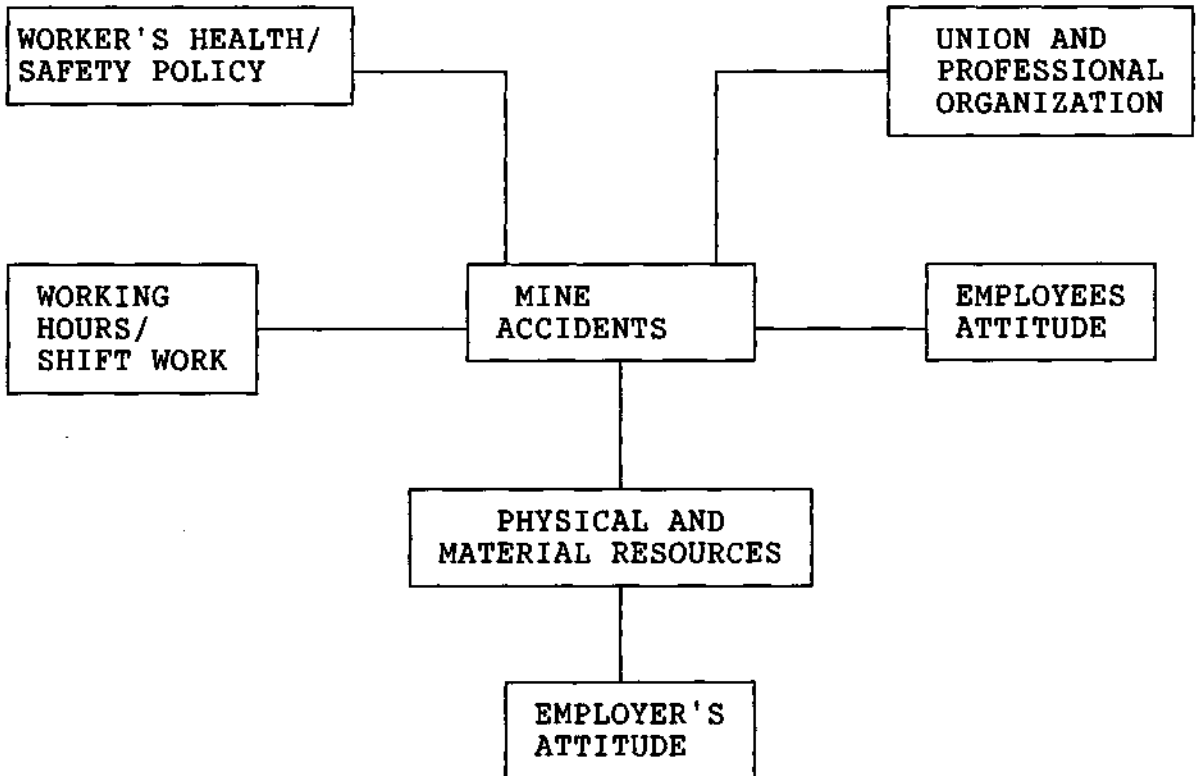
YEAR	NUMBER OF ACCIDENTS
1990	172
1991	172
1992	161
1993	263
1994	197

(Report by Accidents Prevention Department, March 1995).

In many developing countries, inadequate information creates major obstacles to the effective assessment of occupational safety problems and the formulation of policies to deal with them. Even when data are available under reporting remains a major problem (Phoon,1983).

The data on minor accidents reported does not show the real picture because what exists does not include all degrees of minor accidents. This was revealed to the researcher as she interviewed a few concerning the reporting system.

In view of the stated problem it seems many factors may contribute to Mine accidents. The diagram below illustrate the five (5) possible factors (independent variables) that may contribute to Mine accidents (dependent variable).



1.3. LITERATURE REVIEW

Introduction

The literature that has been reviewed indicates that there has not been much done on the contributing factors to Mine accidents. However, the literature reviewed is that which has shown relevance to the topic under study. There are nine (9) broad areas identified to try and give adequate information to answer the question of this study - "What factors contribute to Mine Accidents".

These areas are:-

1. Historical perspective and industrial policies
2. Safety committee
3. Education and Training
4. Stress
5. Working hours and shift work
6. Working environment
7. Equipment and production
8. Individual factors
9. Reporting system

Historical Perspective and Industrial Development Policies

In recent years, the health in the work places has received increasing attention from health professionals, workers, employers and the government due to rising health care costs, an increased understanding of the relationship between behaviour, working conditions and health and the fact that many people spend more time at work than they do at home (King, 1989).

The Occupational Safety and Health Movement had as a primary goal the reduction of work related injuries, illness and death. Interest in occupational health and safety peaked during the period of the "Great Safety" programs of the Democratic - controlled congress (late 1960s and early 1970s) with the passage of federal legislation in protecting workers. Foremost among the laws passed during this period was the Occupational Safety and Health Act of 1970 that created the National Institute of Occupational Safety and Health (NIOSH) in the department of Health, Education and Welfare and the Occupational Safety and Health Administration (OSHA) in the department of labour (House and Cottingham, 1986).

In the 1970s and into the 1980s another movement came up known as Health promotion movement. This movement focused on general health and well being rather than only on work related health problems. It also focused on individual responsibility for health and illness rather than on extent of environment factors (House and Cottingham, 1986). They also suggested that additional attention should be directed at the role of psychosocial environment in work place health promotion.

In recent decades it became apparent that certain aspects of the existing legislation were out of date as having been made for working conditions that were common many years ago.

New technology meant that such conditions were obsolete. In original legislation there were few powers available to the enforcement agencies for controlling health risks, the existing penalties for contravening safety legislation were often inadequate and the original legislation did not involve workers themselves. In many cases hazards, work places, and people at risk were not protected by the existing legislation. (Smith.1989).

Health and Safety at work Act,1974 main purpose was to provide a complete system of law to protect the health, safety and welfare of the workers as well as the health and safety of the public. The Act was designed to modernize the existing legislation which dealt with Health, Safety and Welfare at work. To impose new responsibilities on employers, particularly in requiring them to provide and maintain safe places of work and also to require employers to consult their employees on Health and Safety matters. The Act also provided for creation of a new Health and Safety Commission as well as reorganising the existing Government Inspectorate. The Act also gave new powers for the enforcement of Safety laws and provided for increased penalties for contravention as well as providing new ways of operating Safety Regulations in future. (Morris, 1989).

In a survey done, areas of industrial policy had an important effect on the population and control of health hazards. These were industrial specialization, plant ownership and industrial location. There is evidence given in this scope of policies, that some industrial development that stimulate economic growth may also increase health hazards and counteract measures to improve public health. (El Batawi, 1981).

Safety Committee

Establishing an active safety committee is a pre-requisite for joint management and worker efforts for better safety, health and working conditions. The legal and social conditions for setting up such a committee can be different from country to country.

It is chiefly the safety committee that has overall responsibility for planning and proposing measures to improve the work environment. This includes producing a plan for training courses on work environment issues, taking part in planning the conversion of existing premises, changes in production and work practices, monitoring trends in industrial injuries and when necessary, carrying out investigations for the occupational health service. (Joint Industrial Safety council in Sweden and ILO, Geneva, 1987).

Safety, Health and Working conditions is an ideal area for joint co-operation of government, management and workers. The Chief Inspector of Mines is a Government employee appointed to be responsible for all matters concerning the safety and health of all persons employed in prospecting, exploration and

Mining operations. He is also appointed Chief Inspector of Explosives under the provisions of the Explosive Act, 1974 and has overall responsibility for matters concerning safety in the Manufacture, possession, use, storage, transport, importation in Zambia. The Chief Inspector in liaison with the safety committee hold inquests following a fatal accident to establish among other things how the deceased came to his death. (Annual Report of the Mines Safety Department, 1986).

In the U.K specific industrial processes are usually the responsibility of the appropriate division of the Health and Safety Executive while Local authorities are responsible for non specific areas such as officers, shops, etc but in liaison they provide a forum for the exchange of ideas. (Crawford, 1989).

Education and Training

The need for education and training for employees in Occupational Health, Safety and Ergonomics is very vital in the industries. The main target groups are:-

- Legislators and policy makers
- Managers
- Workers

This is the basic level of education aimed at providing an understanding of the principles of Occupational Health safety in order to promote correct attitudes at work and permit intelligent participation in discussion of any action to be taken (8th Report of the Joint ILO/WHO committee on Occupational Health 1981).

Health education about Accidents Prevention should start with a careful explanation of the general precautions in the work place as well as the special precautions necessary on the job itself. The initial training should emphasize the care and attention which is necessary to avoid risk. The main concern in education is to disperse apathy, stimulate interest and eliminate undesirable procedures. This requires a policy of continuous application of Accident Prevention propaganda designed above all to be stimulating and to arouse interest. The intermittent, ill conceived or badly handled attacks on the problem have little impact and may even acclimatize resistance so that good propaganda is ignored. (Parker, 1971).

In Brazil, the Ministry of Labour has established an active Institute for Occupational Health Safety namely 'Fundacentro' which provides training in industrial medicine. Between 1979 and 1984, 15 000 professional health and safety workers received training there. (Nogueira, 1987).

Literature on Occupational Health in developing Countries emphasized the inadequate training provided in Occupational Safety and Medicine for Medical Personnel, Industrial Inspectors and workers. (Shahnavaz, 1987). It is apparent that in many Countries training in Occupational Safety is not a priority for either the Industrial or Health Sector. Financing, Manpower, Technology and Educational Material are in short supply. In addition, many Occupational Health professionals have been trained in Industrialized Countries and may not be oriented to the principal Occupational disease and accidents in their home Countries. (Micheal et al, 1985).

Even when Government and Industry are aware of the potential environment and Health risks, they may lack the interest, resources or capacity to provide for adequate protection against them. (Lepkowski, 1989). He also asserted that developing nations were encouraging the 'Chemicalization' of industrial production without giving appropriate priority to the promotion and regulation of health and safety. In a number of developing countries undergoing rapid industrialization, the stringency and scope of environmental health and safety regulations are increasing but their enforcement remains weak.

In south Africa, the Labour Unions have assumed a major role in informing trainers of workers' need in helping to determine regulatory and legislative needs. (Myers and Macun, 1989).

Apart from the basic education in Occupational Health, there is need for training for specific tasks. The aim of training for specific tasks, either formally or on the job is to provide the individual with the ability to carry out specific tasks in the Occupational Health and Safety field, either on apart time or on a full time basis. (Education and Training in Occupational Health, Safety and Ergonomics, 8th Report of ILO/WHO, Geneva, 1981).

Stress

Stress has been defined as the non specific response of the body to any kind of demand upon it. (Hans Selye, 1976). Stress components of working focus on factors related to the physical environment (e.g chemical, noise, temperature, odor, Glare etc). and to a lesser extent mass production technology (e.g repetitions or machine paced jobs, shift work, accessibility of the job. (Humburg et al , 1984).

Stress of whatever nature, if too prolonged and too severe can actually overwhelm any person, no matter how well developed the person's adaptive capabilities are, and affect work performance. While short term stress may often help an individual to mobilize his own resources and increase his effectiveness. (Karvonon, 1980). Since this causes psychological stress, an employee may fail to comply to safety rules, leading to injury at work.

The necessity of making an important decision is also a source of stress. The larger the consequences of the decision, the more stress there is likely to be. People demonstrate in many different ways that they are undergoing stress, some of the common clues are changes in personality such as irritability, lack of enthusiasm for activities formerly of interest, inability to concentrate and depression. (Mikheev et al , 1980).

Luckmann (1980) in this research on the effect of combat duty and concentration camp experiences on the individual soldier has more than proved the eventual overwhelming effect of constant stress. Harold Wolff (1980) for example, writes concerning the effects of battle. "..... it may be inferred that everyone has his breaking points, that there are stressors that no man can withstand". Conflict in excess of an individuals current integrative capacity may increase the possibility of an individual being overwhelmed by frustrations and conflicts, hitherto managed successfully. Acts that terrorize, humiliate, destroy self esteem and create integrative effectiveness.

Working Hours and Shift Work

The working day is commonly taken to be somewhere between 07:00 to 18:00 hours. Yet for numerous workers in various industries most of their work hours fall outside this frame. (Poole et al, 1980).

The number of hours of work and the way those hours are organized can significantly affect the day to day life of the worker. It is essential that the workers have free time to rest and leisure in a working day of eight hours (ILO, 1982).

The number of hours worked is one of the principal demands of a job. The basic hours of work are usually fixed by law. These hours of work may be further limited by agreements between employers and employees. The actual hours worked often differ from this normal duration, since overtime can be added. If the hours of work are too long or their arrangement is inappropriate, they can influence Health and Safety, the degree of strain and fatigue and the quality of working life in general (ILO/WHO, 1982).

The traditional legal limits are eight hours per day and 48 hours per week. The ILO Recommendation No. 116 of 1962 reaffirms the 48 hour work week as a basic standard and calls for progressive reduction towards the social objective of a 40 hour work week. The introduction of a five day work week may sometime make it unavoidable to work more than eight hours on at least some of the working days.

The concern over safety has resulted in legislation, for example the Commission of the European Union have limited the number of hours worked at night. There is, however, no direct evidence that injuries are more frequent at night. The injury incidents reported for a year on a rotating three shift system in a large Engineering Company, "the a priori accident" risk appeared to be constant. Though the night shift showed a greater severity of accidents but not an increase in incidences. (Hameline, 1980).

Working on different shifts causes a disturbance in normal biological rhythms. Excessive fatigue during shift work, especially during permanent night work. (When compared with day work has been well documented in questionnaire surveys using machinery such as electroencephalography). The implication of these findings is that working during the night hours may be unsafe. This can be seen at the serious industrial accidents that occurred at chernobyl, three mile Island and Bhopal. (Lancet, Vol 344 No. 8930 founded 1823). The Mufulira Mine disaster also occurred at night in September 1970 (Zambia's Mining Industry, the first 50 years, produced by Public Relations Department, Ndola, 1978). The Mine accidents in an underground Mine in South Africa also occurred at night. (Times of Zambia, May 1995).

Working Environment

Today's work place is faced with accelerating changes in technology. Economic and social developments are also changing the daily life of workers. Despite the progress achieved, the Safety, Health and Conditions of work of many workers remain arduous or give rise to new problems as a result of these changes. (Winett et al, 1989).

The Occupational factors may have both positive and negative effects on a worker's Health depending largely on the nature of a particular factor and the degree of exposure to it. At a work place the noise of machinery can mark the sound of a truck and this can cause accidents because warning shouts and other signals are not heard. Even long periods spent in areas of high noise levels can result in a measurable deterioration in hearing. Noise which is injurious to hearing should be dealt with by technical measures and if this is not possible then personal protective equipment should be used e.g. ear plugs and ear muffs. (Fredlund, 1987).

The work requiring an energy expenditure of more than fifty percent of maximum oxygen uptake usually results in an accumulation of lactic acid in the blood. Therefore, during prolonged work such accumulation will disturb the acid balance and cause fatigue. (Anderson/WHO, 1978).

A study done on the employees who worked in industries found that the working conditions were frequently characterized by considerable variability in the concentration of dust, vapours and gases. It was also found that regardless of the protective wear the employees had, they still had injuries. (Handerson/Haggard, 1968).

Equipment and production

When machinery or equipment is purchased, it should meet safety requirements. The first requirement is that the machine should be constructed in such a way that it is not necessary to add extra protection.

Other safety requirements should include:-

- All protection/guards, maintenance instructions and safety instructions should be included.
- The machine should be sufficiently safe so that the operator will not be injured if his attention should wander or he should make a sudden, reflexive movement.
- Guards or covers that can be opened while the machine is in operation must have switches or devices which cut off the electrical supply (ILO/WHO, 1982).

The absence of technical expertise of funds for the purchase of safety equipment can also limit compliance with regulations in industries. (Noweir, 1986).

Safety devices can be incorporated in machinery and processes but they should not be put out of action for the selfish convenience of the individual. If protective eye shields, clothing, foot wear, gloves are provided they are meant to be used. (Parker, 1971).

In order for the industries to improve their international competitive position and increase export revenue, developing countries have created incentives for investment in targeted industry sectors such as heavy metals, chemical production and the processing of intermediate products, which present severe Health and Environmental Hazards. (Leonard, 1985).

The structure and content of work is changing rapidly. A report commissioned by the Federal Office of Disease Prevention and Health Promotion (FODPHP) and the National Institute of Occupational Safety and Health (NIOSH) provides a glimpse of what the future management hold (Bezold et al, 1986). This report noted several profound changes in the type of work people do and the way in which they do it. For example automation and artificial intelligence have eliminated many jobs, particularly those in manufacturing and service sectors, almost ten percent of the workforce share a job and the average work week has declined to about 32 hours per week. Through advances in information technology, more work is being conducted at home and people are increasingly attempting to balance their careers with concerns about family and self fulfillment. (Altman, 1989).

Individual Factors

The exploration of personal traits has given results that are more convincing why some people are prone to accidents than others. Sigmund Freud, Psychoanalyst has attributed certain accidents to a subconscious self punishment mechanism but this has been applied more to road accidents than to Occupational accidents. The only valid individual factors which can be accepted with an certitude are finally those which are not constitutional but acquired, they include age, (adults have many fewer accidents than the young and some what less frequently than the older workers) training and experience which reduce the number of accidents. (Parmeggiani, 1989).

The analysis of accidents trends done at Mufulira Mine between 1987 to 1989 proved the above theory. The young employees (age group between 18-35 years) were involved in accidents in their first 8 years of service. The age group between 31 to 35 years seemed to be involved in mine accidents after working from 8 to 18 years on the job. The last age group between 41 to 56 years seemed to be involved in accidents after working for sometime in the industry between 22 - 28 years of service. (Psychological Department, Mufulira 1989). This may be attributed to old age as eye sight and hearing decline with age.

It is also the first stages of a new job or a new procedure that are usually the most critical. The same applies when a person changes jobs. Lack of experience and knowledge in a given job makes an employee accident prone. (Safety, Health and working conditions, training manuals, 1987).

Reporting System

In many developing countries, inadequate information creates major obstacles to the effective assessment of Occupational Health problems and the formulation of policies to deal with them. Researchers and regulatory officials often lack access to records held by private industry, multinational firms being particularly difficult to monitor (Phoon, 1983). Data can also be difficult to compile and analyze because of the multiplicity of Government Departments involved in dealing with workers and industrial development. (Christiani et al, 1990).

Karvonon (1980) in his epidemiology study of Occupational Health postulated that Occupational Health records for employees should be kept in the industries. If the facts recorded on treatment charts are accurate and reasonably detailed may be used to indicate dangerous practices and risks of Occupational diseases or identify persons prone to accidents. The records can also be used epidemiologically to assess sickness and behavioural characteristics of working condition groups and to study effects of working conditions such as toxic exposures and different shift system.

Karvonon and Mikheev (1980) in their studies in an Engineering Factory where eye injuries were common, treatment records revealed hazards that could be prevented by improved eye protection and the employment of a highly skilled nurse with ophthalmic training was recommended.

Conclusion

The literature reviewed has shown that not much has been done on the contributing factors to Mine Accidents. With more studies this situation would improve as recommendations would be tried to see the effectiveness of it.

Therefore, the researcher is hopeful that factors contributing to Mine Accidents can be established through this study and solutions, if implemented effectively may improve the working conditions and hence, reduce the severity of Mine accidents.

1.4. OPERATIONAL DEFINITIONS OF VARIABLES AND TERMS

1. **Accident** - An unexpected, unplanned occurrence which may involve injury or lead to death.
2. **Act** - A statute or a written law passed by Parliament, or enactment passed by the Government designed to deal with a service. In this case Occupational Health and Safety in Industries.
3. **General Manager** - An individual responsible for all activities in an organization that is the Mining Industry.
4. **Industry** - Established private owned complex social institution which employ over 500 workers, and whose workers are exposed to dangerous health hazards of varying degrees and an environment which is accident prone.
5. **Miner** - A person employed by the Mining Industry and currently working in the Mine Plant Area especially Smelter, Underground, Concentrator and Refinery.
6. **Union** - A group of workers selected in a working place to represent others in major problems.

CHAPTER 2

2.1. RESEARCH OBJECTIVES

1(a) General Objectives

To determine factors contributing to Mine Accidents at Mufulira Mine Plant Area.

1(b) Specific Objectives

To determine whether the workers' Health and Safety Act is effective to deal with employers in the provision of adequate Industrial Health and Safety Services.

2. To determine whether the Union/Professional Organization representatives are active in encouraging Health and Safety standards in Industries.
3. To establish the employers attitudes towards the provision of physical and material resources in the achievement of organisational goals.
4. To establish the employees attitude towards Safety Regulations in the Industry.
5. To determine whether the working hours contribute to Mine Accidents.
6. To make recommendations to the Management of Zambia Consolidated Copper Mine (ZCCM), Mufulira Division.

CHAPTER 3

METHODOLOGY

3.1. RESEARCH DESIGN

The purpose of this study was to determine the contributing factors to Mine Accidents. A descriptive research design was found to be most appropriate for this study.

Abdella and Levine (1979) define descriptive research design as a research study that does not involve experiments but is primarily concerned with obtaining accurate and meaningful description of the phenomena under study and seeks to know how one or more characteristics are distributed in a population. A descriptive research design thus offers the basis for indicating how events are closely interrelated to one another.

This was a non interventional descriptive qualitative design aimed at identifying and exploring the contributing factors to Mine Accidents. This design was chosen because the study sought to discover facts, confirm facts and establish cause effect relationship between variables.

3.2. RESEARCH SETTING

The study was conducted at Mufulira Mine Plant Area. The division's copper production comes from one of the second largest underground Mine in Africa. Mufulira is second only to Nchanga in terms of copper mined by ZCCM's divisions accounting for about 13 percent of the corporate total. The major operations of

Mifulira Division include Mining, Concentrator, smelter and Refinery. The concentrator treats Mifulira underground Ore only, but smelter is a ZCCM group plant that accepts third party concentrates for toll smelting whilst the Refinery, being a group plant like smelter treats Mifulira, Luanshya and Nkana anodes. By 1993/1994 financial year, the plant production was 180 000 tonnes of anodes copper a year.

Mifulira Mine Plant Area was chosen because it has two group plants for ZCCM and it is easier to reach the target population than if a different setting was chosen.

Secondly, the researcher has worked for a long time in this division and this helped her acquire the right and appropriate data in familiar situation.

3.3. STUDY POPULATION

The study population consisted of all the miners working in the four major operations of the division (4,746 employees). Therefore, the study focused on one sample. Bless and Achola (1988) define a sample as a subset of the whole population which is actually being investigated, studied, observed or interviewed whose findings would be generalized to the entire population.

3.4. SAMPLING METHOD AND SIZE

The researcher used the stratified Random sampling because the units under study were already grouped into strata such that each element of the population belongs to one and only one stratum.

Since the four major operational areas of Mufulira Division have different numbers of workforce and workload, the researcher used the proportionate stratified sampling, to distribute the sample of 60 to the strata to achieve appropriate sample size for each department. The workforce for the four major operations were as follows:- Mining - 3 329, Concentrator - 339, Smelter - 630 and Refiner - 448.

The final sample in each department was selected using the systematic random sampling. This method was less time consuming and easier to perform than the simple random sampling. This method was unbiased because each element had an equal chance of being included in the study. This method enabled the researcher to generalize the findings to the rest of the study population which could not have been possible in a non probability sampling.

3.5. DATA COLLECTION TECHNIQUE

Self administered questionnaires and simple observation.

Self administered questionnaires were answered by the sixty (60) employees because they were literate and required no supervision to answer the questions. The subjects remained anonymous as their names and Mine Numbers were not included. This made the researcher to concentrate on other activities, following the distribution of the questionnaires.

To control the limitations of the self administered questionnaire i.e the low response rate and misunderstandings of the questions. Most of the questions were closed to offer options from which the respondent chose. A few questions

were left open to give chance to the employees to ventilate their in depth feeling as regards to the factors contributing to Mine Accidents. The pilot study was done in the context to reduce the non response questions (See under the heading PILOT STUDY).

During the underground and surface tour of the four major operations of the Mufulira Division, the researcher was able to hold discussions with the Accident Prevention Officers, Foremen, Section Bosses and the General Workers. After each session, the researcher reviewed and completed notes taken during the discussions. This made the researcher not to forget important issues raised during the discussion.

3.6. DATA COLLECTION

The duration of the data collection was 12 days from 28th August to 8th September, 1995. The questionnaires were distributed by the Accident Prevention Officers and the researcher, and they were collected after 4 days.

The information from the questionnaires were checked for completeness and consistency by reading through the completed instrument. And mistakes were corrected.

3.7. PILOT STUDY

A preliminary study was done at the Rigger Shop in the Mine plant area at Mufulira Division from 25th to 27th July, 1995 to test the data collection tool.

Following this exercise some open ended questions were changed to closed ended while some closed ended questions were rephrased for easy understanding by the respondents. A few changes were made on the research proposal.

3.8. ETHICAL CONSIDERATIONS

The researcher sought permission from the Management of ZCCM Medical Ethical Committee and the Divisional Manager Human Resources before collecting the data. The researcher also got verbal permission from the Manager Mining for the same.

Before the administration of the questionnaire, the researcher explained the purpose of the study and assured confidentiality in the responses to be obtained.

3.9. LIMITATIONS OF THE STUDY

The study was conducted within the major limitations of time, finances and busy schedule of the student.

1. The time in which the study was to be submitted to the department of the Post Basic Nursing was too short. There was another research to be completed and submitted within the same time. And at the same time study for the final examinations.
2. And because of time factor, it was not possible to conduct the study on a large scale. It was therefore necessary to have a small sample size, and confine the study to mufulira Division only.

CHAPTER 4

DATA ANALYSIS AND PRESENTATION OF FINDINGS

4.1. INTRODUCTION

The data presented was analyzed into frequency tables, cross tabulations, graphical and numerical descriptions for each table. The data was analyzed by a personal computer.

A total of sixty (60) miners were randomly selected from the four major operations of Mufulira Mine Plant area.

4.2. DATA ANALYSIS

The data collected from the sixty miners were sorted out and edited for completeness and accuracy. Responses from open ended questions were categorized, coded and entered on the master sheet. Descriptive statistics using frequency distribution and percentages were used in tabulating data. This was important for facilitation in the comparison of the same data and summarizing the findings. This type of analysis made it easier to remember facts. The frequencies were made by simple tallying.

4.3. PRESENTATION OF FINDINGS

TABLE 1: SOCIO-DEMOGRAPHIC DATA

	MUFULIRA MINE PLANT AREA, N = 60
a. <u>AGE GROUP</u>	
18-27 years	8 (13%)
28-37 years	23 (38%)
38-47 years	24 (40%)
48 and above	5 (8%)
b. <u>MARITAL STATUS</u>	
Married	58 (97%)
Single	1 (2%)
Separated	1 (2%)
c. <u>EMPLOYMENT STATUS OF WIFE</u>	
Employed	7 (12%)
Unemployed	51 (85%)
N/A	2 (3%)

	MUFULIRA MINE PLANT AREA, N = 60
d. <u>REMUNERATION MONTHLY</u>	
Below K50,000	2 (3%)
K50,000 - K100,000	29 (48%)
Above K100,000	29 (48%)
e. <u>FAMILY SIZE</u>	
No child	4 (7%)
1-3	15 (25%)
4-6	23 (38%)
7-9	14 (23%)
10 and above	4 (7%)
f. <u>EDUCATIONAL ATTAINMENT</u>	
Primary School	3 (5%)
Secondary	49 (82%)
College	8 (13%)

Table 1 shows that most of the mine employees 24 (40%) were aged between 38-47 years old and the majority 38 (97%) were married. The majority 51 (85%) of the miners wives were unemployed. Most of the mine employees 29 (48%) received between K50,000 and K100,000 another 23 (38%) received about K100,000. The majority 23 (38%) of the mine employees had a family size of 4-6 children.

Regarding educational attainment 49 (82%) of the miners have gone up to secondary school level.

TABLE 2(A): EMPLOYEES INVOLVEMENT IN MINE ACCIDENTS

INVOLVEMENT IN ACCIDENTS	N = 60
YES	37 (62%)
NO	23 (38%)
TOTAL	60 (100%)

Table 2(a) shows that the majority 37 (62%) of the mine employees were involved in the mine accidents.

TABLE 2(B): POSSIBLE CAUSES OF ACCIDENTS

POSSIBLE CAUSE	N = 37
Improper methods (for example contravening safety rules)	28 (76%)
Improper conditions (working environment, technical deficiencies)	9 (24%)
TOTAL	37 (100)

Table 2(b) shows that most of the accidents 28 (76%) were caused by improper methods (for example contravening safety rules).

TABLE 3: EMPLOYEES EXPERIENCE REGARDING SHORTAGES OF TOOLS AND MACHINERY SUPPLIES IN THEIR DEPARTMENTS

SHORTAGE OF TOOLS AND MACHINERY	N = 60
YES	45 (75%)
NO	15 (25%)
TOTAL	60 (100%)

Table 3 shows that 45 (75%) of the employees experienced shortages of tools and machinery in their departments.

TABLE 4(a): PROVISION OF PROTECTIVE WEAR TO THE EMPLOYEES

PROVISION OF PROTECTIVE WEAR	N = 60
YES	56 (93%)
NO	4 (7%)
TOTAL	60 (100%)

Table 4 (a) Shows that 56 (93%) stated that they were given protective wear.

**TABLE 4 (B): DISCIPLINARY MEASURES TAKEN AGAINST AN EMPLOYEE WITH
NO PROTECTIVE WEAR**

Disciplinary Measure	N = 60
Charged	30 (50%)
Asked to buy on personal Account	24 (40%)
Forced to Work	6 (10%)
TOTAL	60 (100%)

Table 4 (b) shows that 30 (50%) of the employees stated that mine employees are put on charge if they do not have protective wear.

**TABLE 5: EMPLOYEES AWARENESS OF THE OCCUPATIONAL HEALTH AND
SAFETY POLICY**

Awareness	N = 60
Yes	48 (80%)
No	12 (20%)
TOTAL	60 (100%)

Table 5 shows that 48 (80%) of the employees were aware of the occupational health and safety policy.

TABLE 6: EMPLOYEES KNOWLEDGE ON THE EXISTENCE OF ZOOHS (ZAMBIA ORGANIZATION FOR OCCUPATIONAL HEALTH AND SAFETY)

Knowledge on the Existence of ZOOHS	N = 60
Yes	15 (25%)
No	45 (75%)
TOTAL	60 (100%)

Table 6 shows that the majority 45(75%) of the employees were not aware of the existence of ZOOHS.

TABLE 7: EMPLOYEES AWARENESS OF THE VISITS OF SAFETY INSPECTORS FROM THE MINISTRY OF MINES)

Responses	N = 60
Only when there is a problem	37 (62%)
Once every 3 Months	15 (25%)
Once every 6 Months	6 (10%)
TOTAL	60 (100%)

Table 7 shows that 37 (62%) of the employees stated that the safety inspectors only visited the divisions when there was a problem.

TABLE 8: EMPLOYEES INVOLVEMENT IN ACCIDENTS IN RELATION TO
THEIR AGE

Involvement in Accidents	Age				
	18-27	28-37	38 - 47	48 and Above	Total
Yes	4 (7%)	13 (22%)	16(27%)	4 (7%)	37 (62%)
No	4 (7%)	10 (17%)	8(13%)	1 (1%)	23 (38%)
Total	8 (14%)	23 (39%)	24(40%)	5 (8%)	60 (100%)

Table 8 shows that 16 (27%) of the employees aged between 38 and 47 were involved in mine accidents.

TABLE 9: EMPLOYEES WORK EXPERIENCE IN RELATION TO THEIR INVOLVEMENT IN MINE ACCIDENTS

Work Experience in Years	Involvement in Mine Accidents	
	Yes	No
0 - 5 Years	2 (3%)	8 (13%)
6 - 11 Years	12 (20%)	7 (12%)
12 - 17 Years	7 (12%)	2 (3%)
18 - 23 Years	12 (20%)	5 (8%)
24 +	4 (7%)	1 (2%)
Total	38 (62%)	23 (38%)

Table 9 shows that employees who had worked for 6 - 11 years and 18 - 23 years had the highest rates of accidents, 12 (20%) each category.

TABLE 10: EMPLOYEES INVOLVEMENT IN MINE ACCIDENTS IN RELATION TO
THE TYPE OF ACCIDENT

Involvement in Accidents	Type of Accident			Total
	Minor	1-3 Shift Casualties	MSD (Mine Safety Dept Reportables)	
Yes	25 (68%)	6 (16%)	6(16%)	37 (100%)

Table 10 shows that the majority of accidents that occurred, 25 (68%) of them were minor type of accidents.

TABLE 11: THE TYPE OF ACCIDENTS IN RELATION TO THE POSSIBLE CAUSES

Type of Mine Accident	Possible Causes		Total
	Improper Methods	Improper Conditions	
Minor	19 (51%)	6 (16%)	25 (67%)
1-3 Shift casualties	5 (14%)	1 (3%)	6 (17%)
MSD (Mine Safety Dept Reportables)	4 (11%)	2 (5%)	6 (16%)
Total	28 (76%)	9 (24%)	37 (100%)

Table 11 shows that most of the accidents 28 (76%) were caused by improper methods used by miners.

TABLE 12: THE TYPE OF ACCIDENTS IN RELATION TO TIME OF OCCURRENCE

Type of Accident	Time of Occurrence			Total
	Morning	Afternoon	Night	
Minor	17 (46%)	3 (8%)	5 (14%)	25 (68%)
1-3 Shift casualties	4 (11%)	2 (5%)		6 (16%)
MSD (Mine Safety Dept Reportables)	2 (5%)	3 (8%)	1 (3%)	6 (16%)
Total	23 (62%)	8 (22%)	6 (16%)	37 (100%)

Table 12 shows that most of the accidents 23 (62%) occurred in the morning shift.

**TABLE 13: THE INVOLVEMENT OF ACCIDENTS IN RELATION TO THE TIMES
WORKED MORE THAN 8 HOURS A WEEK**

Involvement in Accidents	Time Worked More than 8 hours a week				Total
	Never	Once a Week	2-3 times a week	> 3 times a week	
Yes	12 (20%)	7 (12%)	13 (22%)	5 (8%)	31 (62%)
No	3 (5%)	9 (15%)	6 (10%)	5 (8%)	23 (38%)
Total	15 (25%)	16 (27%)	19 (32%)	10 (16%)	60 (100%)

Table 13 shows that 13 (22%) of the employees who worked more than 8 hours, 2-3 times a week were involved in mine accidents.

**TABLE 14: THE LEVEL OF EDUCATION IN RELATION TO INVOLVEMENT
IN MINE ACCIDENTS**

Level of Education	Involvement in Accidents	
	Yes	No
Primary	2 (3%)	1 (2%)
Secondary	31 (52%)	18 (30%)
College	4 (7%)	4 (7%)
Total	37 (62%)	23 (39%)

Table 14 shows that the majority 31 (52%) of the miners who were involved in mine accidents had gone up to secondary school level.

CHAPTER 5

DISCUSSION OF FINDINGS AND IMPLICATIONS

5.1. INTRODUCTION

In this chapter the findings of the research study are discussed and appropriate nursing implications made. From these findings the researcher has made some relevant recommendations.

The sample consisted of sixty (6) mine employees from Mufulira Division. The research study was aimed at determining the contributing factors to mine accidents at Mufulira Mine Plant Area.

Socio-Demographic Data

The majority of the employees 24 (40%) were aged between 38 - 47 years old and most of them were married 58 (97%). Most of the employees 29 (48%) received a net pay of K50,000 - K100,000 while another 29 (48%) received above K100,000. The majority of the mine employees 51 (85%) had wives who were not in formal employment. Regarding family sizes, 23 (38%) had 4 - 6 children. The Majority of employees 49 (82%) had attained secondary school education.

This showed that the workforce at Mufulira Plant area, has the majority of employees in their middle ages with a lot of home responsibilities as they are the only breadwinners in their families. Hence, this workforce is not very safe as they have to meet the families needs single handed. In a study done by the psychological department personnel in 1989 also showed that. as people grew older with a lot of responsibilities, they become more prone to accidents. This

was also confirmed by the Industrial Safety Council (1987) that older people are more easily injured and especially that eyesight and hearing also decline with age.

Mine Accidents

The study showed that most of the employees 37(62%) were involved in mine accidents (See Table 4a) and most of the accidents that occurred 25 (68%) were of minor category while the 1 - 3 shift casualties and mine safety department reportable accounted for 6 (16%) each. This meant that 32% of the man hours were lost during the production and this meant a reduction in the human resource at various work places. This confirms that the working conditions were hazardous and were frequently characterized by considerable variability in the concentration of dust, vapours and gases, and regardless of the protective wear the employees still had injuries (Handerson, 1968).

The findings in the study revealed that 56(93%) of the employees were supplied with protective wear and 30 (5%) of the employees who reported on duty without protective wear were disciplined but despite these measures taken the employees still got involved in mine accidents.

This may be due to lack of motivation (Musonda, 1990) or accident proness may be due to physiological deficiencies such as poor reaction times and inadequate muscular coordination (Flipppo, 1987).

Causes of Accidents

The study showed that most of the accidents 28 (76%) were caused by improper methods (e.g. Contravening the safety rules) see Tables 2b, 11). This confirms the assumptions made by Flippo (1984) that in America 4 accidents are caused by human error to every one that is due to technical causes. He also postulated that the human causes are connected with deficiencies in individuals such as improper attitudes, carelessness, recklessness, inability to perform the job, day dreaming, alcoholism and the use of drugs on the job. These findings were also confirmed by a study done on lost time accidents areas of occurrence and their costs done by Musonda (1990) at Nampundwe Mine which highlighted some of the causes of accidents as lack of supervision, failure to exchange warning whistles, reporting to work under the influence of alcohol etc.

The study also showed that the majority of mine accidents 23 (68%) occurred during the morning shift (See Table 12). This can be alluded to the fact that employees work under pressure as the employer is interested in high rate copper production and increase the profits as the sustainability of an industry depend on high profits and as such a lot of mistakes maybe committed resulting in mine accidents.

Problems Related to Provision of Material Resources and Health Related Facilities

The findings revealed that 45 (75%) of the employees experienced shortage of tools and machinery in their work places. (See Table 3) The respondents revealed that most of the shortages 25 (42%) were due to lack of provision of

material resources. These findings were also confirmed by a study done on lost time accidents, areas of occurrence and their costs involving falling of ground at draw and drilling points underground, which revealed that some accidents were due to shortages of tools or using defective tools and machinery. (Musonda, 1990). This was also due to cash budget being in use and the fact that the country is undergoing economic crisis. Rantanen, (1992) reveals that, even provision of tools and equipment is often a matter of prolonged discussions between the employees and the employer. The employer feels that they have discharged their responsibilities since they put up signs/posters regarding safety. This may be true because the employer does not seem to appreciate that a healthy worker is an asset to the industry's economy. This was also revealed to the researcher by the employees who stated that, only chest x-rays at Pneumoconiosis Bureau in Kitwe were mandatory and not these other examinations such as for eyes, ears and general examinations though the employee was allowed to go for such investigations upon realising that he had a problem.

Employees Awareness of, the Occupational Health and Safety Policy, Visits by Safety Inspectors, ZOOHS

The study revealed that 48 (80%) of the employees were aware of the workers health and safety Act (See Table 5).

Table 7 shows that 37 (62%) of the employees stated that the safety inspectors only visited the division when there was a problem. So the administrators have put in place a local inspection to be done by Accident prevention officers, allocated to the four (4) major operational areas in the mine

plant area, as indicated by 47 (78%) of the employees. The reason why the safety inspectors were unable to visit the division was due to shortage of staff at the ministry of mines and transport problems. This was confirmed by a record search that was done in 1983 by Peter Blunt who indicated in his report that out of 9 positions only 3 were filled. This was also revealed by the Safety Inspectors who had come to make an inquest following a fatal accident that occurred on 01/09/95. Apart from the shortage of staff they also faced transport problems (no fuel) so it was impossible for them to visit the division regularly. When there was a major problem at the division, transport was sent for them from the division.

The findings are also supported by observation made which showed that, while the enforcement of the workers health and safety Act could provide workers with standards of care and the Government lacked sufficient staff to inspect every work place on regular schedule to investigate whether the act is being upheld, union/workers' representatives could fulfil the day to day inspection and decision making roles (Blanchard, 1990). Regarding the source of information 37 (62%) indicated that they obtained it from accident prevention officers and 11 (18%) from union representatives. This implies that the union members need to work harder to ensure that all the mine employees are aware of the Act.

Table 6 shows that the majority 45 (75%) of the employees were not aware of the existence of ZOOHS and the 15 (25%) who were aware indicated that the organization did not actively respond to the workers health and safety needs. This is true, considering that the ZOOHS branch in Mufulira was non existent and the first meeting was held on 18/08/95 and that is when the selection of the

health and safety committee was done.

Working Hours

Table 13 shows that the working hours have no major impact on the accident rates as the findings indicated that the difference between the people who worked for more than 8 hours per shift 13 (22%), about 2 - 3 times in a week and those who never worked for more than 8 hours per shift 12 (20%) was quite minimal. This shows that the fatigue experienced by the workers can be mainly due to the environmental atmosphere and the amount of work done in a short period of time. The working conditions such as disorder at the work place, noise, temperature, poor ventilation and poor lighting can influence the employee indirectly thereby causing accidents (Fridlund, 1987). Apart from that it can also be due to the workload and the pressure received from their superiors in the process of having the work done.

Level of Education

Table 14 shows that the majority of the employees 31 (52%) who were involved in mine accidents had gone up to secondary school level. The level of education, therefore, does not seem to effectively equip the mine employees with behaviours that would prevent them from being accident prone.

5.2. IMPLICATIONS

The study revealed that there was a considerable gap between the knowledge on safety rules and the actual practice of the mine employees in their work places. The occupational health and safety services seem to be facing a lot of problems, requiring immediate and serious attention.

The company's involvement in this situation would be widely viewed as very necessary to protect the workers' safety. There is need to enforce the existing occupational health and safety Act and have mandatory access to management and employees. This may prevent the accident rates from going up at the division.

The study revealed that most of the employees had negative attitudes towards their work so they needed to be motivated and encouraged, not just through monetary gain but through the provision of social amenities as well. The working climate is so tense that employees work in fear and this breeds more shortcomings in an individual. The employees should be regarded as an important asset in the industry and not just a tool of production.

The study also revealed that most of the employees that were involved in mine accidents had inadequate material resources and also lack of supervision and support from their superiors. This implies that supervision of employees should be the priority of management but this does not necessary mean breathing on the necks of the subordinates. Management should also ensure that the employees have the essential tools to use to minimize using shortcuts in their daily operations.

CHAPTER 6

CONCLUSION AND RECOMMENDATIONS

6.1. CONCLUSION

The study was aimed at determining the factors contributing to mine accidents. The desire to carry the study was a result of concern the researcher had for the employees who were involved in mine accidents and the consequences they faced thereafter.

The study revealed that most of the accidents 37 (62%) were due to the negative attitude that the employees had when carrying out their daily duties. Though most of the employees were knowledgeable about the safety rules and regulations, they rarely practiced the right methods of executing their duties. This made them more susceptible to mine accidents.

The study also revealed that the management of ZCCM, Mufulira Division had a negative attitude in relation to provision of essential tools and machinery to the employees. Since 45 (75%) of the employees worked with inadequate tools or defective machinery in the mine plant area.

It was also revealed that the professional association and the union representation were not very active in creating awareness among the employees concerning the workers health and safety. These associations are supposed to educate and safe guard the rights of the employees and see to it that there was minimal exposure of the employees to the hazardous environment. As they interact

with these miners a lot of problems can be unveiled and solutions found to prevent or reduce mine accidents at the division.

The researcher concludes that human behaviour is very complex and needs to be handled with care. It is essential to remember that each man has his own view of his life and must be free to fulfill it and that in many ways he is a far better judge of it than any other person, as he has lived through and felt what other people have only seen. Since most of the factors contributing to mine accidents seem to centre on the human element, the work of the superiors, therefore, should be to bring the subordinate to the point of considering and to the spirit of judging rightly than to consider or judge for him. Therefore, this study will create greater safety awareness in future managers by teaching more safety practices in their work places.

6.2. RECOMMENDATIONS

1. There is need for the study of this nature to be conducted on a larger scale so that generalization of findings can be made to the whole mining industry.
2. There is need to have a trained industrial doctor and a nurse who can be able to relate effectively to miners in the plant area.
3. To upgrade the plant site clinic into a mini hospital (e.g. 10 bed capacity hospital) so that some of the periodic examinations such as for sight, hearing can be done there and the nurse would keep a record of each

~~employee~~ and it would be easier to send call outs for check ups. Since it is within the plant area the employees would not waste much of the productive time. The food handlers can also undergo the tests in the plant area.

4. Since some of the supervisors had poor supervisory skills, Human Resource Development Department should arrange for refresher courses to equip them with new information.

The supervisors (Foremen) should be trained as counsellors so that they will be able to guide and identify problems in the employees earlier so that appropriate measures can be carried out in good time.

5. It is necessary to train more safety officers to ensure re-enforcement of safety rules in the various departments.
6. To create awareness of ZOOHS among the employees and encourage them to join so that the organizations can provide a forum where employees could discuss issues pertaining to the safe working conditions.
7. To introduce suggestion boxes pertaining to ideas on how Mufulira Mine can be made as an accident free mine.
8. To orient miners' wives on mine operations and what is expected of them in terms of giving moral support and encouragement to reduce on the tension that the miners undergo in their work places.

9. Management should secure a video player and Television set for the Accident Prevention Department so that they can be able to show the miners on hazards and how they can be prevented, their wives and school children can be incorporated in, on a regular basis.

10. The Accident Prevention Department in conjunction with Mifulira Little Theatre Club can sketch a play - highlighting the causes of accidents and how they can be prevented and how the family members can relate to the miner to help reduce the involvement in mine accidents.

11. There is need for the concentrator employees to be given risk allowances, since their work place is full of dust and his may lead to respiratory infections in later life.



*Bibhanyia
before
Affidavits*

THE UNIVERSITY OF ZAMBIA

SCHOOL OF MEDICINE

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DEPARTMENT OF POST BASIC NURSING

P.O. Box 50110
Lusaka, Zambia

15th June 1995

Your Ref:

Our Ref: FBN/ D/BScIV-95

The Secretary
Research and Ethics Committee
ZCCM
MUFULIRA/KITWE

Dear Sir/Madam,

Re: RESEARCH STUDY

In partial fulfilment of the Bachelor of Science in Nursing Degree Programme at the University of Zambia, School of Medicine, Department of Post Basic Nursing.

Mrs Grace Kansumba Chituka is requested to undertake a research study in order for her to graduate. Her intended research topic is on: "A STUDY TO DETERMINE THE FACTORS CONTRIBUTING TO MINE ACCIDENTS IN BLOCK, MUFULIRA DIVISION."

Data is to be collected during the months of July-August 1995, and attached here with is the Research Proposal.

I hope that the Committee will grant her the necessary permission to undertake the research.

Yours faithfully,

P M Ndele
P M Ndele (Mrs)
RESEARCH CO-ORDINATOR

c.c. Head of Department of PBN.

enm.

SCHOOL OF MEDICINE
UNIVERSITY OF ZAMBIA

P.O. BOX 50110, LUSAKA, ZAMBIA

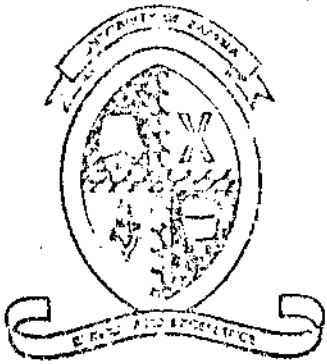
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DEPARTMENT OF POST BASIC NURSING

16th February, 1975

TO WHOM IT MAY CONCERN COMP No 9.2254772

I wish to confirm that.....*GRACE CHITLIKA KANSUMBA*..... is a Fourth Year BSc N student at the Department of Post Basic Nursing, School of Medicine, UNZA. The student is currently carrying out a Research Project titled.....

A study to determine the factors contributing to mine accidents at Mufulira Mine Plant Area

We shall be most grateful if you or your organisation can give what ever assistance the student may require.

Thanking you for your continued support and co-operation.

Patricia M. Ndele (Mrs)
NURSING RESEARCH LECTURER



Zambia Consolidated Copper Mines Limited *FOR ATT: SJ*
Incorporated in the Republic of Zambia *MK Chituka*
OPERATIONS CENTRE

Our Ref : GMA/165/95

15 August 1995

The Chief Medical Officer
 Mufulira Mine Hospitals
 P O Box 40062
MUFULIRA

Dear Sir

MRS GRACE K CHITUKA - RESEARCH STUDY

Find enclosed documents on the above employee from your Division which were inadvertently mailed to me.

The Manager - Human Resources OPC has advised that all training expenses are to be borne by the sponsoring Division. I can only recommend that the study being conducted by Mrs Chituka is very relevant to ZCCM and should therefore be supported.

Yours faithfully


JOHN C MASANGE
GROUP MEDICAL ADVISOR

cc Manager - Human Resources, OPC

Enc

ANNEX IV

QUESTIONNAIRE

Questionnaire for the Mine employees on
"What factors contribute to Mine accidents at Mufulira Mine
Plant Area.

Number _____

INSTRUCTIONS

1. Please do not write your name, Mine Number or Address
2. Kindly tick () in the appropriate spaces provided or write the appropriate answers in the spaces provided.
3. The information you will give will be treated as confidential
4. Do not mark in the space written
"FOR OFFICIAL USE ONLY"

SECTION I-DEMOGRAPHIC DATA

**FOR OFFICIAL
USE ONLY**

1. What is your age - last birth day?

2. Marital Status

a) Married

b) Single

c) Separated

d) Windowed

e) Divorced

--

3. If married, indicate whether wife is employed or not

a) Employed

b) Unemployed

--

4. What is your monthly income?
(Net pay)

a) Below K50 000

b) K50 000 - K100 000

c) Above K100 000

--

5. Family size

a) No Child

b) 1 - 3

c) 4 - 6

d) 7 - 9

e) 10 and above

--

6. What is your educational level attained?

- a) Never been to school
- b) Primary School
- c) Secondary School
- d) College
- e) University

--

7. What is your religion?

- a) Protestant
- b) Catholic
- c) Muslim
- d) Hindu
- e) BAHAI FAITH
- f) Other (Specify) _____

--

8. How long have you been working for this division?

- a) 0 - 5 years
- b) 6 - 11 years
- c) 12 - 17 years
- d) 18 - 23 years
- e) 24 and above

--

9. Have you ever been involved in a Mine accident?

- a) Yes
- b) No

--

10. What type of accident (s) ?

- a) Minor
- b) 1-3 Shift Casualties
- c) MSD (Mine Safety Department)

11. If answer is 'Yes' to question '9'
What type of injury (ies) did you
suffer?

12. What do you think would have been the
possible cause (s) of this/these
accident (s)?

13. Is this your own view only or of other
workers as well?

- a) own view only
- b) of other workers as well

14. What time did the accident occur?

- a) Morning
- b) Afternoon
- c) Night

SECTION 2 - WORKING HOURS/SHIFT WORK

**FOR OFFICIAL
USE ONLY**

15. How many times in a week do you work more than 8 hours a day?

- a) Never
- b) Once a week
- c) 2-3 times a week
- d) More than three times a week

--

16. How often do you work over the weekend?

- a) Never
- b) Once a month
- c) Twice a month
- d) More than twice a month

--

17. Do you do shift work?

- a) Yes
- b) No

--

18. If the answer is 'Yes' to question 17 which type?

- a) Afternoon shift
- b) Night shift
- c) Both

--

19. How often do you do shift work in a month?

- a) Once a month
- b) Twice a month
- c) Continuous

--

20. How many sick days did you have
this year because of ill health?

- a) None
- b) 1-7 days
- c) 8-14 days
- d) 15-21 days
- e) 22 days and above

--

21. When did you last go on long leave?

- a) 3-7 months ago
- b) 8-12 months ago
- c) 2-3 years ago
- d) Can't remember

--

**SECTION 3 - EMPLOYER'S ATTITUDE,
AVAILABILITY OF PHYSICAL/MATERIAL
RESOURCES AND EMPLOYEE'S ATTITUDE.**

22. What do you do in your spare time?

23. How often do you have your
performance appraised?

- a) None
- b) Quarterly
- c) Every 6 months
- d) Once every year

--

24. When did you last receive a bonus as a department?

- a) Never
- b) A month ago
- c) 3 months ago
- d) 6 months ago
- e) Can't remember

--

25. Do you experience shortages of tools and machinery supplies in your department?

- a) Yes
- b) No

--

26. If answer is "Yes" to question 25 what is the main reason for the shortages?

- a) Non availability
- b) Lack of market
- c) Management does not put them as important
- d) Funds are released late

--

27. Does your department provide workers with protective/safety equipment or material?

- a) Yes
- b) No

--

28. If answer is "Yes" to question 27,
what happens to an employee who
reports on duty without protective
wear?

29. If answer is "No" to question 27,
what could be the main reason?

- a) Management have turned a blind
eye on the issue
- b) I don't know
- d) Other (specify) _____

SECTION 4 - WORKERS' HEALTH ACT:
ACTIVENESS OF UNION AND THE
PROFESSIONAL ASSOCIATION.

30. Are you aware of a policy on
occupational health and safety at
your division?

- a) Yes
- b) No

31. If the answer is "Yes" to question
30, what is the source of your
information about this policy?

- a) Accident Prevention Department
- b) Union
- c) Both

32. Do you have any comments about the
Workers Health Act?

a) Yes

b) No

33. If "Yes" what comments do you have?

34. Are you involved in making major
decisions affecting the workers
health and safety at your division?

a) Yes

b) No

--

35. If the answer to question 34 is
"Yes" through whom _____

36. Are you aware of the existence of the
ZOOHS (Zambia Organisation of
Occupational Health and Safety) in
Zambia.

a) Yes

b) No

--

37. If "Yes" to question 36,

- a) Does ZOOHS respond actively to workers health and safety?
- b) Does not respond to workers health and safety

--

38. If the answer to question 37 is 'b' what is the main reason?

- a) Workers are not aware of association
- b) workers are not interested to join
- c) The association has no legal and financial support from the government
- d) The goals are not clear

--

39. How often is your department visited by the Chief Inspector/ Safety Inspectors from the Ministry of Mines?

- a) Only when there is a problem
- b) Once every 3 months
- c) Once every one to two years
- d) Once every 6 months
- e) Have never visited

--

40. Is there any local health and safety inspection arrangement in your division?

- a) Yes
- b) No

BIBLIOGRAPHY

1. Abdellar, FG and Levine, G (1979) **Better patient care through Nursing Research**, Mac Millian Publishing Co., London.
2. Bless, C with A Chola, P (1988) **Fundamentals of Social Research Methods**, Government Printers, Lusaka.
3. Bwalya, E M, (1994) **A study to determine factors contributing to lack of established oral Rehydration therapy corners in Lusaka Urban Clinic**. UNZA, LUSAKA.
4. Brownlee, A et al (1991) **Designing and conducting Health Systems Research Projects Volume 2**. Health Sciences Division of International Development Research Centre, Ottawa, Canada.
5. Mulenga, T (1993) **A study on factors affecting the effectiveness of Occupational Health Services in Industries**. UNZA, Lusaka.
6. Shipili, P (1993) **A study to determine effects of the user fees on the utilization of Health Services at UTH**. UNZA, Lusaka.
7. Cheelo R and Ngalande T C (1994) **Report on Eye Clinic Data Analysis for 1993 - 1994**. Unpublished.
8. Cooper Weil D E et al (1990) **The impact of development policies of health**, WHO Publication, Geneva.
9. Fridlund L, (1987) **Safety - Health and working conditions**. Joint Industrial Safety Council, Stockholm.
10. Nawakwi, E (1993) **Safety standard upset Minister**, Zambia Daily Mail Vol I No. 886.
11. Parmeggiani L, (1989) **Encyclopedia of Occupational Health and Safety**, Vol I, 3rd Revised Edition, ILO, Geneva.
12. Phoon, W.O (1993) **Occupational Health in Developing Countries**. A simple case of neglect World Health Forum Vol. 4 No.1.

13. Sharpe C, (1993) **Kempe's Engineers Year Book 98th Ed., B P C C Wheatons Limited, Tonbridge.**
14. Analysis of accident trends at Mufulira Division 1987 - 1989 by Mining Department. Unpublished.
15. Mufulira Mine Scene, October, 1994 Vol. I Issue 7
16. Strive for fatality free operations, 'Mining Mirror, March, 1995 No. 335.
17. Occupational Safety and Protection J 7/1 by ROSPA (The Royal Society for the Prevention of Accidents) Occupational Safety Division, 1978.
18. ZCCM Corporate Profile, Darnell, Lusaka, 1993.
19. Zambia Mining Industry. The first 50 years Public Relations Department, Ndola, 1978.
20. ZCCM 'The way forward, Mining Journal Company Supplement, London, October, 1992, Vol; 319 No. 8194.
21. Anderson, K L (1987) **Habitual Physical Activity and Health**, Copenhagen, WHO Regional Publication, European Series No.6.
22. Asbury, T et al (1980) **General Ophthalmology** 9th ed. Large Medical Publications California.
23. Bond, R G et al (1973) **Environmental Health and Safety in Health Care facilities**, Mac Millian Publishing Co., Inc. New York.
24. Haulon, J J (1974) **Public Health Administration and Practice**, 6th ed. The C V Mosby Co. Saint Louis.
25. Jackson, M H et al (1989) **Environmental Health Reference Book**. Butterworths. London.
26. Karvonon, M et al (1980) **Epidemiology of Occupational Health**, WHO Regional Publications, European Series No. 20.
27. Kozier, B (1983) **Fundamentals of Nursing Concepts and Procedures**. 2nd ed. Addison - Wexey Publishing Co. California.
28. Luckman and Sorensen (1980) **Medical and Surgical Nursing, A Psychological Approach**, 2nd ed. W B Saunders Co. Philadelphia.
29. Margot, J F (1983). **Community Health Care and Nursing Process**, 2nd. The C V Mosby Co. Saint Louis.

30. Nelson, A M et al (1971) **Public and Community Health** 2nd ed Staples Press, London.
31. Smith, L et al **Increased Injuries on night shift**, The Lancet Vol. 344, No 8930 founded 1823.
32. Winett, R A et al (1989) **Health Psychology and Public Health**, Pergamon Press, New York.
33. Annual Report of the Mines Safety Department for the year 1986, printed by the Government Printers, Lusaka.
34. Education and Training in Occupational Health, Safety and Ergonomics, 8th report of the Joint ILO/WHO Committee on Occupational Health. WHO, Geneva, 1981.
35. Epidemiology of work related diseases and accidents, 10th report of the Joint ILO/WHO Committee on Occupational Health, WHO, Geneva, 1989.
36. Annual report of the Mines Safety Department, 1986.
37. Kabwe, F J (1991) **Investigation into Materials Handling Accidents in the Refinery Department, Module III Project**, Mufulira, ZCCM (1990 - 1991).
38. Fisanga D (1990) **Fall of Ground Accidents from 1986 - 1990 Project**, Module III of the Safety Management Course, ZCCM, Konkola Division.
39. Ngoma, E, (1991) **Study on Chemical Accidents November - November, 1991** ZCCM, Nkana Division - Chambeshi Mine.
40. Musonda, E M (1990) **Safety Management Course Practical Project, /lost time accidents, areas of occurrence and their costs involving falling of ground at draw and drilling points underground personal injuries 1985 - 1990** ZCCM, Kabwe Division - Nampundwe Mine.
41. Flippo, E B (1984) **Personnel Management**, 6th ed. Mc Graw Hill International Editions, Toronto.
42. Cherrington, D J, (1987) **Personnel Management**, 2nd ed. W M. C. Brown Publishers, College Division, USA, Chicago.

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