

## Health Hazard among UNICEM Worker in Cement Production and Environment

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### ABSTRACT

This study examined health hazard among Unicem workers and the environment, the basic problem that necessitated the study was to identify the effect of cement production on the health condition of workers in UNICEM. A cross sectional design sampling technique was used to select respondent and gathered data from three department of Unicem Cement industry. A descriptive, analytical research approaches were used for the study. The researcher adopts a sample size of 60 (sixty) respondents who represented a total respondent rate. Data were gathered from both primary and secondary source. Data gathered were expressed in a simple percentage, grouped in tables and analyzed using the chi-square  $\chi^2$  statistical test on the hypothesis. Based on the analysis and interpretation, the study showed that 43 workers have health defects. 20 workers developed headaches chronic cough, runny eyes, skin burn, skin boils, larynx, 8 workers, have stomach cancer, colon cancer. 6 workers, developed conjunctivitis, chest tightness. 3 have lung cancer, 6 workers developed structural abnormalities. 8% of workers were unable to decide on their stand. 7% of worker disagreed that no significant relationship between production of cement and health condition of workers. Finally the study is arranged in five distinct chapters with recommendation and bibliography.

*Keywords* —Put your keywords here, keywords are separated by comma.

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### 1.1 INTRODUCTION

Cement production in Nigeria has remained a steady economic resource with a corresponding increase in daily demand and supply rates following the fast advancement in the nation's infrastructural development such as roads, drainages, buildings etc. These economic benefits derived from the production of cement is relatively associated with environmental health impact caused by direct exposure of cement Mill workers to (cement dust) during production process, resulting in temporary or permanent impairment of human body organs such as the Lungs, Skin, Eyes, Heart, Liver etc.

Inhalation of cement dust according to Meo (2003) causes severe health defect such as chronic

obstructive lung disease, restrictive lung disease, pneumoconiosis and carcinoma of the lungs.

Yang et al (1996) in his view of cement dust relate prolonged exposure of mill workers to cement dust as the cause of malfunctioning of major body organs such as the tissues, heart, liver, spleen, bone, muscles and hairs.

According to Yang, cement dust if not properly prevented may enter into the systemic circulation of human body and reach essential organs including tissues, respiratory organs and the heart and ultimately affects their micro-structure and physiological performance.

Cement dust according to El-sewefy et al (1970) contained toxic particulate contaminants which penetrates the human respiratory system

through environmental air pollution. When this polluted air is inhaled by the mill workers, direct penetration of these contaminants takes place. Contents of cement include mixture of Calcium oxide (cao) (62%-66%), silicon oxide (Si O<sub>2</sub>) (19%-22%), Aluminum tri-oxide (AL<sub>2</sub>O<sub>3</sub>) (4%-8%), Ferric oxide (fe<sub>2</sub>o<sub>3</sub>) (2%-5%), Magnesium Oxide (Mao) (1%-2%) and also Selenium, Thallium and other impurities (El-Sewefy et al 1970).

Unicem cement workers, like other cement mill workers, suffers similar effect of cement's dust and environmental pollutants. These constitute major risks factor which jointly develops occupational diseases. This form of hazard faced by cement workers is very difficult to manage. This is confirmed by Oleru (1984) who opined that production activities in cement industry such as quarrying of line stone, handling of raw materials during grinding of clinker, blenching of Cement materials, packing and shipping of cement (finished product) jointly exposed workers to severe health hazard causes by cement dust at various stage. This form of air pollution according to Oleru (1984), releases cement particle which ranges from 0.05 to 5.0 micrometer in diameter into air, which constitute major air pollutants. These particles are respirable in size. Impact is severe and must be mitigated if not completely prevented. These invite reasons for a research on health hazard among UNICEM. Cement workers and the Environment.

## 1.2 STATEMENT OF PROBLEM

Cement mill workers are exposed to cement dust and air pollution at various stages and processes of manufacturing and producing cement. These are ranges from quarrying of lime stone, grinding of clinker, handling of cement raw materials, blending of cement materials, packing and shipping of finished product of cement. This is result in the spreading and distribution of particulate air pollutants into air through cement dust. These particles which are about 0.05 to 5.0 micrometer in diameter are respirable in size and constitute potential cause of occupational health hazards. Hence the problem of this study is to investigate.

- i. The significant relationship between the production of cement and health condition of workers in UNICEM Company.

- ii. Effect of cement dust on human respiratory system.
- iii. Cement dust as the major cause of occupational diseases such as stomach and colon cancer among UNICEM workers.
- iv. Clinical measures of mitigating the effects of cement health hazards among UNICEM cement workers.

## 1.3 RESEARCH HYPOTHESIS

The following hypothesis will be tested to accomplish the objective of this research study:

1. Ho: There is no significant relationship between the production of cement and health condition of workers in UNICEM Company.
2. Ho: Cement dust does not affect the human respiratory system.
3. Good clinical measures can not mitigate the effects of cement health hazards among UNICEM Workers.

## 1.4 OBJECTIVES OF THE STUDY

The objectives of this study are:

- (i) To find out the significant relationship between Cement production and the health condition of mill workers in UNICEM Company.
- (ii) To examine the effects of cement dust in human respiratory system.
- (iii) To evaluate cement dust as a major cause of occupational diseases such as stomach and colon cancer among UNICEM workers.
- (iv) To identify clinical measures of mitigating the effect of cement health hazards among UNICEM workers.

## 1.5 SIGNIFICANCE OF THE STUDY

- (i) The study will provide relevant information cement companies on effective means of controlling health hazards caused by cement dust in the production environment.
- (ii) Data used in the study will help other researchers who may develop interest in conducting further studies on health

hazards caused by the production of cement.

- (iii) The study will enlighten cement mill workers on the possible means of avoiding direct exposure of body sensitive organs to cement dust which is harmful to their health.
- (iv) Data used in the study will served as useful resources material for the general public.

## 1.6 SCOPE AND LIMITATIONS OF THE STUDY

The scope of this study encompasses the general health hazard caused by cement production in the industrial environment.

The following factor limits further expansion of this study:

Inadequate finances to reach out to people in far distance places for more data acquisition.

Delay in collecting back questionnaire that were administered to respondents.

## 1.7 DEFINITION OF TERMS

**HEALTH:** This is viewed as the living condition of individuals within a specific environment.

**HAZARD:** Environmental mishaps which pose direct negative effect on human health and the environment.

**CEMENT:** Cement is a building material made grinding calcined limestone and clay to a fine powder which can be mixed with water, and it set as a mortar or concrete.

**EFFECT:** Direct impact caused by a particular phenomenon or activities e.g Cement production.

**DISEASE:** Illness or ailment caused by air pollution through cement dust.

**ENVIRONMENT:** This is defined as the total of activities taking place within a specific surroundings.

## 2.1 CEMENT PRODUCTION

Before the invention of cement the earlier structure were composed of earth raised in the form of walls demes by running successive layers of stone block for one above another without the aid of any cementing materials. The stability of walls was derived entirely from the regular placing of heavy masses of stone without any assistance from adhesion. With the passage of time, people began to constrict their homes with a mixture of sand and a cementations materials consisting of lime and or gypsum.

From twelve century onward, the quality was improved and the limes bring burnt and well sifted. Joseph Aspdin, in October, 1824 used a hard lime stone mixed with clay grinding to fine slurry with water and then broke the mixture into a suitable lumps and Calcines them in furnace, similar to a lime kiln has the carbonic acid was expelled. The mixture was so calcined and rolled for a fined powder.

Cement is a fine soft, a Powderly type substance; it is made from a mixture of cement that is found in a natural material such as limestone, clay, sand, or shale. When cement is mixed with water, it bind and gravel into a hard solid mass called concrete; concrete is a material used in building construction consisting of a hard, chemically inert particulate substance known as an aggregate (usually made from different together by cement and gravel) that is bonded together by cement and water. Fine aggregate is used for making concrete slabs and smooth surfaces.

**Content of Unicem Cement:** Cement is a mixture of Calcium oxide, Silicon oxide, Magnesium oxide.

## 2.2 EFFECT OF CEMENT PRODUCTION ON UICEM WORKERS

Unicem cement is produced in a factory under consideration of different substances and toxic pollutants especially the limestone and clay, which processed, are being heated to approximately 1250<sup>0</sup>c for a period of 90 minutes. (El-sewefy et al

1980). The chemical reactions which take place during heating process produces four major phases which are known as Tri-Calcium, Tri-silicate, O-calcium silicate, Ferrite phase and Tri-calcium aluminates phases. These substances are toxic in nature and are either inhaled by the workers or directly contacted with skin through rubbing effect. The final product of cement is obtained by grinding its contents with different rates for the different phases and these generate different forms of substances which are either introduced into air, water or land which moved down to the aquifers level causing pollution at various stages. These can be summarized under the following.

### **2.2.1 HUMAN HEALTH EFFECT**

Consistent exposure of cement works to dust which rise during the production process at various stages such as quarrying of limestone, handling of raw materials used for cement production, grinding of clinkers, blending of cement product, packing of cement and shipping of finished products can provoke or caused chemical symptoms and inflammatory responses that may wither result in permanent or temporary ailment and abnormalities. According to Jenny et' al (1960). The most frequently reported clinical features in cement mill workers are chronic cough and phlegm production, impairment of lung function, chest tightness, obstructive and restrictive lung diseases. In the view of Alikija et al (1990) general clinical manifestations caused by human exposure to cement dust include skin irritation, conjunctivitis, Stomach ache, Terminal Fatigue and Carcinoma of the lungs. Oleru (1984) in his view of health defect cause by human exposure to cement dust our listed. Stomach and colon cancer resultant health effect. These environmental health effects are so tremendous and in some levels tend to outweigh its associates economic benefits. Workers exposed to cement dust suffer complications during treatment of health structural abnormalities. This often results in terminal sickness such as cancer or asthma (Yang et al 1996).

## **2.3 EFFECT OF CEMENT DUST ON HUMAN RESPIRATORY SYSTEM**

The human respiratory system consists of the lungs veins and arteries which are operationally interrelated and interdependent. High concentration and prolonged inhalation of cement dust by workers in cement companies can provoke clinical symptoms through inflammatory response which may result in functional and structural abnormalities. According to Oleru (1984), the most frequently reported clinical features in cement mill workers are chronic cough and phlegm production, impairment of the lung function, chest tightness, obstructive and restrictive lung disease, skin irritation, conjunctivitis, stomach ache, headache, fatigue and carcinoma of the lungs. The severity of these health problems depends on the high risk associates with the production environment. Workers who are directly exposed to cement dust suffers more problem that those workers exposure to cement dust is temporary or periodically. Workers directly exposed to cement dust during cement production are those in the cracking department, packing and packaging units. Others include workers in the storage/warehouse units.

### **2.3.1 THE LARYNX**

Larynx is part of the respiratory organ found in the anterior neck region of human at the level of the C3 C6 vertebrae. It is placed at the upper part of the air passage situated between the trachea and the root. In the views of Maier (1992 Pg. 45) prolonged exposure of human larynx to cement dust through inhalation constitute increase risk of overall cancer problems among cement workers. The risk associated with cement dust is predominantly related to supra glottis cancer. Noor et al (1981) observed that, apart from respiratory diseases, cement dust also course the cancer of larynx and lung. Olsen and Sabore (1984) confirmed the high risk of laryngeal cancer in semiskilled and unskilled workers to be directly caused by workers direct exposure to cement dust especially in the cement industries.

### **2.3.2 THE HUMAN LUNGS**

Alikija et al (1990) and Yang et al (1996) observed that prolonged exposure of human respiratory system to cement dust constitute major

risk factor to lung cancer. In the view of Siracusa et al (1998), Lung function parameters FVC and FEV, decreased with duration of employment in cement industry. Similarly, Gomzi et al (1989) demonstrated that, the lung function indices FVC and FEV in cement mill workers were negatively related with duration of exposure.

Summarily, Alakija et al (1990) confirmed that cement mill workers has a consistent decline in FVC and FEV with prolonged years of service in the cement industry.

Alakija (1990) showed that, in cement mill workers Peak Expiratory Flow (PEF) decreased with prolonged years of service and workers who has spend less than five years in cement industry has a significantly higher peak expiratory flow than workers who has put in more than fifteen (15) years in service.

Mengesha and Bekele (1998) in similar views observed a significant decrease in forced expiratory flow 25-75% (FEF) and peak expiratory flow in mill workers within the industry compared to their control.

Meo et al (2002) demonstrated a decrease PEF and maximal voluntary ventilation (MVV) in cement mill workers. These parameters were also further decreased with increased in duration of exposure.

In a different view of these parameters defect related cement mill workers and exposure to cement dust, Kakacic et al (1973) observed that restrictive ventilator changes appear in cement mill workers. In their observation, they indicated that these changes appeared to be less prominently seen initially and later became more prominent at later stages of prolonged years of service. Furthermore, in restrictive lung disorders the forced vital capacity is reduced, but does not slow the delivery of air so that FEV is similarly reduced but FEV<sub>1</sub>/FVC ration remains normal or even increase.

### **2.3.3 CHEST RADIOGRAPHY EXAMINATION**

Scansetti et al (1985) on chest radiography found that pleural thickening in about one quarter of cases put of 100 Italian cement mill workers is seriously viewed based on prolonged years of

exposure in each round of radiographic examination.

Abrons et al (1977) observed the prevalence rate of about 2% for pleural abnormalities predominantly bilateral diffuse plural thickening in cement mill workers. In addition Meo et al (2003) confirmed that pulmonary radiographic abnormalities such as interstitial lung diseases, pleural thickening and chronic bronchitis are common health hazard faced by cement mill workers. Cement mill workers suffered from chronic abnormalities compared to controls. Resultant effect according to Cybula et al (1991) is terminal problem of tissue fibrosis and emphysema in cement will workers. Health hazards among cement mill workers are numerous and very difficult to keep within boundaries, Prosperi and Barsi (1957) confirmed this in their view of micro nodulation in the lungs offer prolonged exposure in cement industry.

## **2.4 CEMENT HEALTH HAZARD: THE GASTRO INTESTINAL SYSTEM**

1. **The Oral Cavity and Teeth:** Struzak and Bozy (1989), observed that the condition of the oral mucosa in workers of cement plant increases with significant increase in years of services. Clinical examination demonstrated features of mechanical trauma and oral mucosal inflammation in all workers exposed to cement dust.

In the view of Tuominen (1991), the effect of cement and stone dust on teeth, the tooth surface loss is always very high with about (72.2%) increased ratio in mill workers as compared to controls which levels at (48.4%).

In both the maxillae and the mandible the amount tooth surface loss was greater in the exposed workers than in the controls and both anterior and posterior teeth were affected. These findings indicate that tooth surface loss caused by work-related dust should be considered on occupational hazard. The intensity of the periodontal diseases was greater in workers exposed to cement dust than in controls and a very high incidence of deep peritonitis was noted in young workers of the cement plant. Consequently, workers

in cement industry suffer Oral health conditions with severe dental diseases. Workers exposed to cement dust witness high prevalence of dental caries with number of decayed, missing and filled surfaces along with poor periodontal conditions. They also reported the cases of teeth with gingivitis, calculus and pockets deeper than 5mm. The prevalence of dental abrasion was 100% in particular, abrasions were observed on the front teeth.

## **2.5 CEMENT HEALTH HAZARD: EFFECT ON HUMAN LIVER**

The human liver is another delicate intestinal organ which performs major function in the general body system. It delicate organ is directly affected by cement dust inhaled by workers during production process.

According to Pimental and Menezes (1978) described diffuse swelling and proliferation of sinusoidal (hepatic) living cells, sarcoid type granulomas and perisinusoidal and portal fibrosis in the liver of cement mill workers. These changes according to permental et al. are closely related to inhaled cement dust. In their opinion, the inhaled cement particulars reach the liver by the blood stream and produce different types of hepatic lesions and they also found cement dust conclusions in the liver.

### **2.5.1 THE HUMAN STOMACH**

Oleru (1984) indicated cement dust as the major cause of stomach ache and in IARC report of (1980), it was reported that Portland cement contains Chromium in its Hexa-valent form, which is an established carcinogen and causes the cancer of stomach.

In addition to Oleru's view, Amandus (1986) studies the mortality of United States cement plant and quarry workers and confirmed that the vital status of a cohort of 5292 men who has been employed for at least five years in cement plant between 1950 and 1980 has been visible and significantly hazardous. The mortality experience was evaluated for 4231 white men for whom complete work histories and demographic information were obtainable. He suggested that, the

deaths from stomach cancer were significantly increased during 1965-74 but not over the entire follow up period (1950-80).

Peritoneum: Kolev and Shamkov (1975) study the morphological changes occurring upon intra peritoneal application of cement. Initially, the changes in the peritoneal cavity were mainly necrotic and exudative, while after subsiding, granuloma was found around the un-eliminated dust particles.

The result of the exercise confirmed direct influence of cement dust introduced into the peritoneal cavity of experimental animals and reported that the peritoneal cavity is more suitable for investigation of the cumulative action of dust with fibrous and toxic effect.

## **2.6 CEMENT HEALTH HAZARD AND THE HUMAN CARDIOVASCULAR SYSTEM**

Maciejewska (1987) in his study on the effect of cement dust in human heart introduced siliceous dust by intra-tracheal administration in rats and found an increased level of collagen due to fibrosis in heart of the rats.

The findings of this animal study indicate that silica is deposited in the heart when introduced by in-tracheal. Route and cause fibrosis hence the collagen contents are increased in the heart. This confirms that cement dust directly affects the heart.

### **2.6.1 HEAD AND THE NECK**

Maier et al (1999) suggested that workers in the construction industry carry an increased risk for head and neck cancer due to exposure of occupational carcinogenic agents. These substances include cement dust, asbestos, tar products, metal duet and paints.

Maier (1991) conducted a study on the number of subjects exposed to wood dust, organic chemicals, coal products or to cement and observed an increased relative risk for head and neck cancer after exposition to wood dust to cement.

The cancer risk due to cement due to cement exhibition showed a positive correlation to the duration of exposition.

### **2.6.2 EYES**

Cement dust has been identified as an eye allergen and can cause runny eyes and conjunctivitis (Oleru, 1984). In addition, Sanderson et al (1999) found that workers at a Portland cement plant had experienced acute eye irritation when performing maintenance inside a Kiln Unit of a cement plant.

### **2.6.3 SKIN AND HAIRS:**

Lachapelle (1986) described that, cement dust has been identified as a skin problem factor that can cause itching, skin allergen irritant and also cause skin boils and burn. Reichrtolea (1986) found the bioaccumulation of industrial cement dust components in laboratory animals exposed by inhalation of cement emission and reported that, the chemical components of the cement dust particles inhaled by animals are accumulated in the hairs of the exposed animals. In addition, Brockhaus et al (1981) reported that thallium containing atmospheric dust caused by emission of the cement plant effects the population

Reichrtova (1986) found the bioaccumulation of industrial cement dust components in laboratory animals exposed by inhalation of cement emission and reported that, the chemical components of the cement dust particles inhaled by animals are accumulated in bones of the exposed animals.

Pond et al (1982) added the Cement Kiln Dust (CKD) in the feed of weanling pig for a 42 days experiment and found that the body weight gain was depressed and also observed lesions of the humerus bone along with Osteonecrosis, thinning of cortex and reduction of epiphysis cartilage.

#### **2.8.1 MUCLES**

Meo et al (2002) showed the decreased performance of intercostals muscles on the basis of EMG findings and also suggested that when cement dust enters into the blood stream it may also reaches the skeletal muscles and affects their structure and performance. Therefore, the intercostals muscle of cement mill workers exhibit reduced performance due to the deposition of cement dust in muscle cells Sarcoplasm and is probably associated with the changes in muscle structure.

living around the cement plant and the residents exhibited increased hairs thallium level.

### **2.7 LYMPHATIC SYSTEM: SPLEEN AND THYMUS:**

Duorianinouich (1993) conducted a study on the effect of administration of clinkers and cement dust and observed the harmful effect of industrial cement dust on the lymphatic organs especially spleen and thymus.

He observed diminished lymphatic tissue, decreased DNA, RNA and total protein levels. Maciejewska (1987) induced 50mg of siliceous dust by intra-tracheal administration in rats and tested the affected rats and found an increased level of collagen due to fibrosis in spleen of the rats. This animal study finding showed that silica is deposited in the spleen when introduced by intra-tracheal route and caused fibrosis hence the collagen contents are increased in spleen.

### **2.8 MUSCULOSKELETAL SYSTEM: BONE:**

#### **2.8.2 CONGENITAL ABNORMALITIES AND DISABILITIES**

Dolgner et al (1983) reported that thallium dust generated during cement production causes congenital malformation in the population living in the vicinity of the cement plant. These congenital abnormalities were cleft lip and palate, facial hamangioma, uterus neonatorum, swelling on the back of hands and feet, inguinal hernia, umbilical hernia, lumbar meningomyelocele and ventricular sepal defect. However, lumbar meningomyelocele and ventricular sepal defect later on may cause medical disabilities. On the basis of the above literature described, it has been demonstrated that cement dust causes chronic obstructive lung diseases, restrictive lung disease, lung function impairment, pneumoconiosis, and carcinoma of larynx, lungs, stomach and colon. In addition it has been 12 suggested that, the components of cement dust also enter into blood stream and may also reaching the different tissues of the body including heart, liver, spleen, bone, muscles and hairs, and

affecting their micro-structure and physiological

performance.

Unit, the supervisory unit and the management unit. This represents the total respondent's rate used for the study.

## **RESEARCH METHODOLOGY**

### **3.1 INTRODUCTION**

This chapter is aimed at expressing the methods, designs and statistical procedures employed in collecting and analyzing data used for the study.

### **3.2 DESIGN OF THE STUDY**

This study involved the use of descriptive, analytical research approaches to examined, described, and analyzed relevant data gathered in the course of executing this research work. However, the entire work is arranged in five separate but interrelated and interdependent chapters to aid understanding and effective assessment.

### **3.3 AREA OF STUDY**

A cross sectional design sample survey technique was used to select and gather data from five selected cement industries within Nigeria and beyond. Although focus is on UNUICEM Company of Nigeria otherwise known as the United Cement Company of Nigeria Limited, Calabar, and Cross River States. This cross sectional view was made to aid direct comparison and examination of relevant data used for the study.

### **3.4 POPULATION OF THE STUDY**

The population of this study encompasses the entire staff of the United Cement Company of Nigeria Limited (UNICEM) Calabar branch of Cross River State.

### **3.5 SAMPLE SIZE/SAMPLE PROCEDURE**

The sample size of the study comprised of 60 respondents selected from the company's total population of 154 staff.

The 60 respondents were randomly selected from the three section units comprising the labour

### **3.6 SOURCES OF DATA**

Data used for the study were sources from primary and secondary sources.

The primary source of data comprises information gotten from the questionnaires that were administered to the respondents and other selected staff of the company.

The secondary data were sourced from text books, journals, health magazines, internet network and partly, from interview that was personally conducted with some selected staff of the company by the researcher.

### **3.7 MODEL SPECIFICATION FOR DATA ANALYSIS**

Data collected for the study were presented on tables, expressed in simple percentages, and analyzed using the chi-square ( $\chi^2$ ) statistical formula to aid and ease understanding. The actual computation of the hypothesis level showed in the contingency tables is indicated in chapter four of this research work.

#### **3.7.1 THE CHI-SQUARE EXPRESSION**

The chi-square is defined as the test of goodness of fit. It is mathematically expressed as follows

$$X^2 = \sum \frac{(F_o - F_e)^2}{F_e}$$

Where:

$X^2$  = The sum of the quantity obtained by dividing observed frequency ( $F_o$ ) with the expected frequencies ( $F_e$ ).

$$DF = (R-1) (C-1)$$

#### **DECISION RULE**

This is the final stage of the data analysis which gives the expected result from the data that were collected and analyzed. The null hypothesis is rejected where the computed  $x^2$  value is greater than the ( $x^2$ ) chi-square table value and is accepted when less than the computed chi-square ( $x^2$ ) table value. The affirmation of the hypothesis result proves

positive while the rejection of hypothesis prove negative view of the facts.

**PRESENTATION, ANALYSIS AND INTERPRETATION OF DATA**

**4.1 INTRODUCTION**

This chapter focuses on the presentation of data gathered, analysis and interpretation of the data based on questionnaire administration. treated and returned accordingly. This represented the overall data used for the study.

**Table 1: Showing Response to Questionnaire Administration among UNICEM**

S/N	Respondent	Number of Questionnaire Administered	No of Questionnaire Returned	Percentage
1.	Administration Department	20	20	33.33
2.	Production Department	20	20	33.33
3.	Packing/Loading Department	20	20	33.33
	<b>Total</b>	<b>60</b>	<b>60</b>	<b>100%</b>

**Table 2: Educational and Sex Distribution of the Respondent**

QUALIFICATION	ADMIN. DEPT			PRODUCTION DEPT.				PACKING/LOADING	
	SEX		TOTAL	SEX		TOTAL	SEX	TOTAL	
	Male	Female		Male	Female			Male	Female
Master/above	13	2	15	2	1	3	2	1	3
B.Sc/HND	2	2	4	2	2	4	2	1	3
OND/SSCE	1	-	1	11	2	13	12	2	14
<b>TOTAL</b>	<b>16</b>	<b>4</b>	<b>20</b>	<b>15</b>	<b>5</b>	<b>20</b>	<b>16</b>	<b>4</b>	<b>20</b>

From table 2 above, 10 respondents were sample from the Administration Department on their sex and educational status, 13 male workers had M.Sc. degrees and above, while 2 female had similar qualification. 2 male and 2 female had B.Sc/HND precisely while only 1 male worker had OND/SSCE qualification.

From the production Department 2 male workers and 1 female worker had Masters Degree and above, while 2 male and 2 female workers had either B.Sc or HND degree. 11 male workers had

**4.2 PRESENTATION AND ANALYSIS OF DATA**

Out of the misting staff strength of 154, 60 were randomly selected and served with copies of questionnaire. This entire questionnaire were

**Source:** Data from Questionnaire Administered Interpretation

From table 1 above, a total of 60 copies of questionnaire were distributed through the supervisory heads of three departments namely Administration Department 20 copies representing 16.7% production Department 20 copies representing 41.66%, and the packing/loading Department 20 copies representing 41.66%. This entire questionnaire were completed and returned accordingly through the supervisory assistance of the departmental heads. This represents 100% respondents rate used for the study.

OND/SSCE while only 2 female workers fall under similar category. From packing Distribution department, 2 male and 1 female workers had either B.Sc or HND while 12 male and 2 female workers had either OND or SSCE qualification.

**TEST OF HYPOTHESIS NO 1**

Ho: There is no significant relationship between the production of cement and health condition of workers in UNICEM company.

**Table 3: Relationships between Production of Cement and Health Condition of UNICEM Worker**

VARIABLE	ADMIN. STAFF		PRODUCT ION STAFF		PACKING/LOADING STAFF	
	Respondent	%	Respondent	%	Respondents	%
Agreed	16	80	14	70	15	75
Undecided	2	10	2	10	3	15
Disagreed	2	10	4	20	2	10
<b>TOTAL</b>	<b>20</b>	<b>100</b>	<b>20</b>	<b>100</b>	<b>20</b>	<b>100</b>

L		0		0		0
		0		0		0

Source: Response to question No.1

VARIABLE	ADMIN. STAFF		PRODUCTION STAFF		PACKING/LOADING STAFF	
	Respondent	%	Respondent	%	Respondents	%
Agreed	13	65	11	55	16	80
Undecided	4	20	4	20	2	10
Disagreed	3	15	5	25	2	10
<b>TOTAL</b>	<b>20</b>	<b>100</b>	<b>20</b>	<b>100</b>	<b>20</b>	<b>100</b>

Source: Response to Question No.4

**INTERPRETATION**

Table 3 shows that 16 respondents representing 80%, 14 respondents representing 70% and 15 respondents representing 75% agreed that there is significant relationship between the production of cement and health condition of workers as represented by each of the department.

2 respondent representing 10%, another 2 respondents representing 10% and 3 respondent representing 15% from each of the three departments remained undecided on the view while 2 respondents representing 20% from production and 2 respondents representing 10% from Packing/Loading departments disagreed on the view that there is significant relationship between the production of Cement and health condition of workers in UNICEM.

**Table 4: Observed and Expected Frequency for Hypothesis No 1**

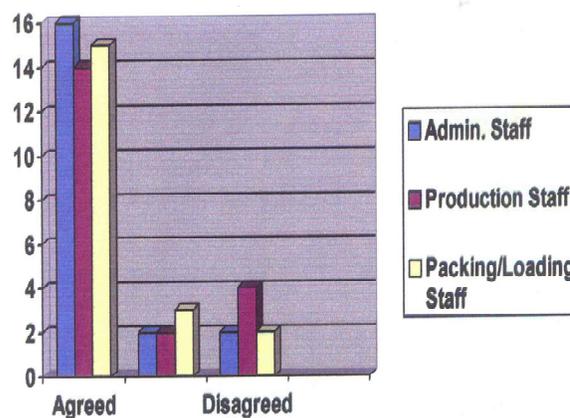
ADMIN. STAFF					PRODUCTION STAFF					PACKING/LOADING STAFF				
O	E	O-E	(O-E) <sup>2</sup>	$\frac{(O-E)^2}{E}$	O	E	O-E	(O-E) <sup>2</sup>	$\frac{(O-E)^2}{E}$	O	E	O-E	(O-E) <sup>2</sup>	$\frac{(O-E)^2}{E}$
16	20	4	16	0.8	14	20	6	36	1.8	15	20	5	25	1.25
2	20	-18	-324	16.2	2	20	-18	-324	16.2	3	20	17	289	14.49
2	20	-18	-324	16.2	4	20	-16	-256	12.8	2	20	18	324	16.2
20	60	40	904	33.2	20	60	40	616	30.8	20	60	40	638	31.9

with degree of freedom at 4. Therefore, the null hypothesis is rejected in acceptance of the alternative hypothesis which states that there is significant relationship between the production of cement and health condition of workers in UNICEM Company. This affirms that cement production has significant effect on the health of workers in Cement Industry.

**HYPOTHESIS NO 2**

Ho: Cement dust does not affect the human respiratory system

**Table 5: Effect of Cement Dust on Human Respiratory System**



From the analysis above, the calculated chi-square ( $\chi^2$ ) of 33.2 for Administrative Staff, 30.8 for Production Staff and 31.9 for packing/Loading Staff respectively represented the analysis of the study Degree of freedom DF = (3-1) (3-1) = 4.

**DECISION**

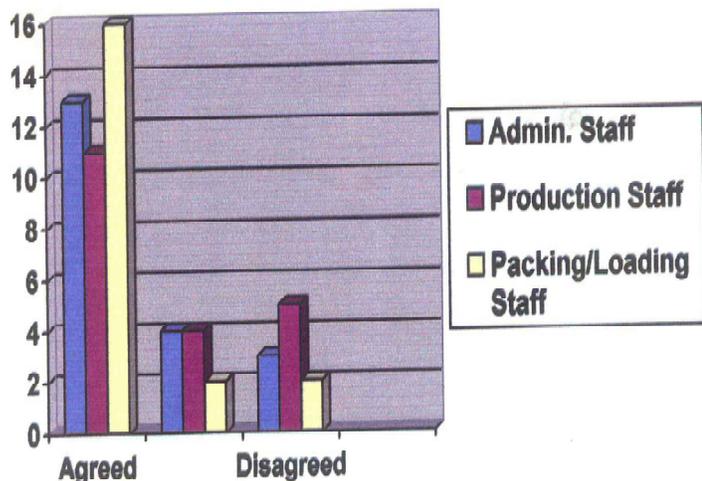
From table 4 above, the calculated chi-square ( $\chi^2$ ) value of 33.2 (Administrative Staff), 30.8 (Production Staff) and 31.9 (Packing/Loading Staff) was greater than the chi-square ( $\chi^2$ ) table value of 9.48 at 0.05% level of significance.

From Table 5 above, 13 respondents representing 65% for Administrative Staff, 11 respondent representing 55% for Production Staff and 16 respondent representing 80% agreed that Cement dust affects human respiratory system.

4 respondents representing 20%, another 4 respondent representing 20% and 2 respondents representing 10% from the three departments remained undecided. Consequently 3 respondents representing 15%, 5 respondents representing 25% and 2 respondents representing 10% disagreed on the view that Cement dust affects human respiratory system.

**Table 6: Observed and Expected Frequencies for hypothesis No. 2**

ADMIN. STAFF					PRODUCTION STAFF					PACKING/LOADING STAFF				
O	E	O-E	(O-E) <sup>2</sup>	(O-E) <sup>2</sup> /E	O	E	O-E	(O-E) <sup>2</sup>	(O-E) <sup>2</sup> /E	O	E	O-E	(O-E) <sup>2</sup>	(O-E) <sup>2</sup> /E
1	2	7	49	2.45	1	2	9	81	4.05	1	20	4	16	0.8
4	2	16	256	12.8	4	2	16	256	12.8	2	20	18	324	16.2
3	2	17	289	14.45	5	2	15	225	11.25	2	20	18	324	16.2
2	6	40	594	29.5	2	6	40	562	28.1	2	60	40	664	33.2



From the analysis above, the calculated chi-square ( $\chi^2$ ) of 29.7 for Administration Staff, 28.1 for Production Staff and 33.2 for packing and Loading Staff represented the analysis of the study. Degree of Freedom DF = (3-1) (3-1) = 4.

**DECISION**

From table above, the calculated chi-square  $\chi^2$  value of 29.7 (Admin. Staff) 28.1 (Production Staff) and 33.2 (Packing/Loading Staff) was greater than the chi-square ( $\chi^2$ ) table value of 9.48 at 0.05% level of significance with degree of freedom at 4. Therefore the null hypothesis is rejected in acceptance of the alternative hypothesis which states that Cement dust affect human respiratory system. This analysis affirms that Cement dust is the major cause of respiratory diseases among Cement mill workers in UNICEM.

TABLE 23: TABLE OF CHI SQUARE ( $\chi^2$ )

df	.99	.98	.95	.90	.80	.70	.50	.30	.20	.10	.05	.02	.01	.001
1	.000157	.000628	.00393	.0158	.0642	.148	.455	1.074	1.642	2.706	3.841	5.412	6.635	10.827
2	.0201	.0404	.103	.211	.446	.713	1.386	2.409	3.219	4.605	5.991	7.824	9.210	13.815
3	.115	.185	.352	.584	1.005	1.424	2.366	3.665	4.646	6.251	7.815	9.837	11.341	16.268
4	.297	.429	.711	1.064	1.649	2.195	3.357	4.878	5.989	7.779	9.488	11.668	13.277	18.465
5	.554	.752	1.145	1.610	2.343	3.000	4.351	6.064	7.289	9.236	11.070	13.388	15.086	20.517
6	.872	1.134	1.635	2.204	3.070	3.828	5.348	7.231	8.558	10.6645	12.592	15.033	16.812	22.457
7	1.239	1.564	2.167	2.833	3.822	4.671	6.346	8.383	9.803	12.017	14.067	16.622	18.475	24.322
8	1.645	2.032	2.733	3.490	4.594	5.527	7.344	9.524	11.030	13.362	15.507	18.168	20.090	26.125
9	2.088	2.532	3.325	4.168	5.380	6.393	8.343	10.656	12.242	14.684	16.919	19.679	21.666	27.877
10	2.558	3.059	3.940	4.865	6.179	7.267	9.342	11.781	13.442	15.987	18.307	21.161	23.209	29.588
11	3.053	3.609	4.575	5.578	6.989	8.148	10.341	12.899	14.631	17.275	19.675	22.618	24.725	31.264
12	3.571	4.178	5.226	6.304	7.807	9.034	11.340	14.011	15.812	18.549	21.026	24.054	26.217	32.909
13	4.107	4.765	5.892	7.042	8.634	9.926	12.340	15.119	16.985	19.812	22.362	25.472	27.688	34.528
14	4.660	5.368	6.571	7.790	9.467	10.821	13.339	16.222	18.151	21.064	23.685	26.873	29.141	36.123
15	5.229	5.985	7.261	8.547	10.307	11.721	14.339	17.322	19.311	22.307	24.996	28.259	30.578	37.697
16	5.812	6.614	7.962	9.312	11.152	12.624	15.338	18.418	20.465	23.542	26.296	29.633	32.000	39.252
17	6.408	7.255	8.672	10.085	12.002	13.531	16.338	19.511	21.615	24.796	27.587	30.995	33.409	40.790
18	7.015	7.906	9.390	10.865	12.857	14.440	17.388	20.601	22.760	25.989	28.869	32.346	34.805	42.312
19	7.633	8.567	10.117	11.651	13.716	15.352	18.338	21.689	23.900	27.204	30.144	33.687	36.191	43.820
20	8.260	9.237	10.851	12.443	14.578	16.266	19.337	22.775	25.038	28.412	31.410	35.020	37.566	45.315
21	8.897	9.915	11.591	13.240	15.445	17.182	20.337	23.858	26.171	29.615	32.671	36.343	38.932	46.797
22	9.542	10.600	12.338	14.041	16.314	18.101	21.337	24.939	27.301	30.813	33.924	37.659	40.289	48.268
23	10.196	11.293	13.091	14.848	17.187	19.021	22.337	26.018	28.429	32.007	35.172	38.968	41.638	49.728
24	10.856	11.992	13.848	15.659	18.062	19.943	23.337	27.096	29.553	33.196	36.415	40.270	42.980	51.179
25	11.524	12.697	14.611	16.473	18.940	20.867	24.337	28.172	30.675	34.382	37.652	41.566	44.314	52.620
26	12.198	13.409	15.379	17.292	19.820	21.729	25.336	29.246	31.795	35.563	38.885	42.856	45.642	54.052
27	12.879	14.125	16.151	18.114	20.703	22.719	26.336	30.319	32.912	36.741	40.113	44.140	46.963	55.476
28	13.565	14.847	16.928	18.939	21.588	23.647	27.336	31.391	34.027	37.916	41.337	45.419	48.278	56.893
29	14.256	15.574	17.708	19.768	22.475	24.577	28.336	32.461	35.139	39.087	42.557	46.693	49.588	58.302
30	14.953	16.306	18.493	20.599	23.364	25.508	29.336	33.530	36.250	40.256	43.773	47.962	50.892	59.703

If  $\chi$  is a random variable which has a  $\chi^2$  distribution with  $df$  degrees of freedom the table gives the values which  $\chi$  will exceed with the given probabilities (P). For  $df$  larger than 30, the value from the expression  $\sqrt{2\chi^2} - \sqrt{2df-1}$  may be interpreted as a  $t$  ratio

**SUMMARY, CONCLUSION AND RECOMMENDATION**

**5.1 SUMMARY**

This study centered on Health Hazard among UNICEM workers And the Environmental in Cross River State. The major objective of the study was to identify the effect of Cement production on the health condition of workers in UNICEM Company.

From the above objectives, the following findings were ascertained, that there is significant relationship between Cement production in UNICEM and the health condition of workers. That Cement dust is the major cause of occupational disease such as Stomach and colon Cancer among UNICEM workers.

That clinical measures such as the used of protective equipment, Air Filters, proper handling and avoidance of dust can reduce the health impact caused by Cement.

The study is arranged in five distinct chapters (60) respondent rate is used to ascertain the data base for the study through statistical analyses.

## 5.2 CONCLUSION

The study aimed at examining the health hazards among UNICEM workers in the Cement Production Environment.

Objectives were to identify the major causes of respiratory ailment; lung cancer, bronchile meningitis, stomach cancer, colon cancer and carcinoma of the lungs.

Through the existing relationship between cement production and the health condition of workers in UNICEM, it was ascertained from the result of the findings that; Cement dust is the major cause of respiratory disease.

It was also revealed that cancerous sickness in Cement mill workers is caused by workers consistent exposure to cement dust.

The findings also revealed that he use of clinical measures such as protective gloves to handle cement bags, the used air filters to protect direct inhalation of cement of cement and avoidance of cement dust generated during production can reduced the hazardous risk of contacting the associated sickness caused by cement production in UNICEM.

## 5.3 RECOMMENDATION

### (A) CLEANING METHODS:

1. Workers in the Cement Company should used dry clean up methods that do not cause airborne dispersion to clean cement example the used of vacuum cleaner for (Industrial portable Units equipped with high efficiency particulate filters(HEPA Filters).
2. The used of midst to avoid excessive dust generation or wet cement method to reduce dust generation.
3. Avoid direct inhalation of

### (B) HANDLING METHODS:

1. The used of rubber hand gloves and protective shoes should be encourage at every department where workers have direct contact with cement.
2. Workers should avoid direct skin contact with Cement.
3. Spilled materials containing cement products or chemicals should be put in protective containers

### (C) MEDICAL/CLINICAL METHODS:

1. Cement mill workers should undertake periodic medical check-up
2. Workers should be provided with respiratory treatment drugs to avoid occupational/terminal diseases.

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## LETTER OF INFORMATION

Department of Civil Engineering  
Engineering Faculty  
University of Uyo  
Uyo  
Akwa Ibom State.

Dear Respondents,

## QUESTIONNAIRE FOR RESEARCH PROJECT

I am a final year student of the Civil Engineering University of Uyo, Akwa Ibom State. The questionnaire is designed to enable me write a research project on the health hazard among Unicem Cement Worker and the environment.

You are please request to provide answers to the question in questionnaire, all information is vital to the analysis of data. Using solely for academic purpose and will be treated strictly in confidence.

Yours faithfully,

## UNIVERSITY OF UYO, UYO AKWA IBOM STATE DEPARTMENT OF CIVIL ENGINEERING, A QUESTIONNAIRE ON “THE INVESTIGATION ON HOW CEMENT PRODUCTION AFFECT THE WORKERS AND THE ENVIRONMENT. (A CASE STUDY OF UNICEM CEMENT FACTORY CROSS RIVERS STATE).

Please tick appropriate in the box provided

1. **Ages:** 20-30 [ ] 20-40 [ ] 40-50 [ ]
2. **Work Experience:** 1-5yrs [ ] 6-10 [ ] 11-15yrs [ ] above 15 [ ]
3. **Gender:** Male [ ] Female [ ]
4. Do you use personal protective equipment while working in the factory: Yes [ ] No [ ]
5. Does your company have a safety departmental unit: Yes [ ] No [ ] None of the above [ ]
6. Have you been affected by dust as a result of working in the factory: Yes [ ] No [ ] None of the above [ ]
7. Have you develop and notice any breathing problems or have difficulties in breathing since you started working in the factory? Yes [ ] No [ ]
8. Does the safety personnel go on routine check to spot our hazard and prevent accident if yes, what the duration of the checking. 2 month [ ] 5 month [ ] a year [ ] a year and above [ ]
9. Is the altitude of the workers toward accident prevention co-cordial? Yes [ ] No [ ] None of the options [ ]
10. Have you been diagnosed of any cancer if yes? State the month and year. 1-5 [ ] 6-10 [ ] 11-15 [ ] above 15yrs [ ]
11. Have you notice any skin irritation in your body? Yes [ ] No [ ]
12. Since you started working in the factory have you experience a chronic cough and chest tightness? Yes [ ] No [ ] none of the option [ ]
13. Have you notice any runny eyes and conjunctivitis? Yes [ ] No [ ] none of the option [ ]
14. In case of an accident does your company provide a van or ambulance to convey people to the hospital? Yes [ ] No [ ] none of the option [ ]

15. Did you have any previous training on safety before you were employed in the factory? Yes [  ] No [  ] none of the option [  ]
16. Does your safety supervisors lay more emphasis on accident prevention? Yes [  ] No [  ] none of the option [  ]
17. Are those adequate safety device installed in the factory? Yes [  ] No [  ] none of the option [  ].
18. Have you notice any skin boils and burn in your body? Yes [  ] No [  ] none of the option [  ]
19. Are machine serviced regularly to avoid accident? Yes [  ] No [  ] none [  ]