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Effect Of Dust On Some Liver Parameters Among Quarry Workers In Umuoghara, Ezza North Local Government Area, Ebonyi State, Nigeria

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Abstract: ***Quarry factory involves excavation of underground stones and crushing of them into different sizes for building houses, roads and other industrial uses. The prospective study was undertaken to evaluate hazard associated with it on the workers biochemical parameters (Livers and kidney functions) of 50 study workers were compared with that of 50 control healthy subjects. The status of liver and kidney parameters of the quarry workers were not significantly different from the status of non-workers (P> 0.05). Nevertheless, quarry dust arising from crushing seems to be the main hazard in quarry factory but the scope of this work did not cover pulmonary parameters which could be the major thrust of quarry hazard.***

***Keywords**: Quarry, parameters, dust, liver, biochemical, kidney, function*

I. INTRODUCTION

The desire for urbanization and social transformation has given a boost to the construction of industry, building, road construction, bridges and other physical structures and all developmental projects which need quarry stones. This increased demand for quarry stone places much pleasure on the quarry industry and by extension on the available staff. Some quarry industries therefore engage more hands to strengthen the workforce so as to meet the market demand (WHO, 1972). Quarry dust is a waste product obtained during quarry processing. Quarry dust which is obtained from breakdown of large stone (also known as stonedust) has some effect on some kidney and liver parameters (Fatosi & Oborbor, 1996). Coarse airborne particles have been shown to have an adverse effect on health (Brunekreef & Forsberg, 2005; Sandstrom et al., 2005). Particles that remain in the body for a long time increase the potential to cause disease.

Stone quarrying however is a multi-stage processed by which rocks are mined and crushed to produce aggregates that are finally being screened into various sizes for immediate use. Each of the stages has potential for dust production, the inhalation of this quarry dust have been associated with various pulmonary as well as acid-base disorders (Abron et al, 1988). Stone quarrying is a multi-step process by which rock is extracted from the ground and crushed to produce aggregates (Northstone,2008) Rotary drill operators, front end loader operators, truck drivers, and crusher operators are permanently exposed to stone dust (Chekan & Colinet, 2002). Quarry workers therefore are those workforce or individuals who have been employed to work in the quarry industry. The peculiarity of this employment is that they are employed to work in each of the stages of this quarrying based on their capacities to function there and are paid according to the quantity of work per day.

Quarry dust is the inorganic substance given off as fine dust particles in the air during quarrying process. It comprises of coal, carbon, asbestos, iron and mostly silica which has the greatest quantity among others. This dust is the most significant hazard in the quarry industry because the two components (silica and asbestos) that it contains have been reported to be so carcinogenic such that when inhaled, it penetrates the lung of workers to inflame their tissues. This distorts the normal respiratory process, leaving these lungs with enlarged hardened scar tissues. (Alakija *et al*, 1990).

The lung is known for its role of maintaining the acid-base balance in the body in conjunction with other organs like the kidney. Acid refers to any substance that can donate a hydrogen ion is any substance that can accept hydrogen ion. The above definition serve to focus attention on hydrogen ion as the significant item in acid –base balance (Welt et al.,1964). Stone crushing plants (quarry) constitute an important industrial sector in Nigeria. They are engaged in producing crushed stones of various sizes which acts as raw materials for construction of roads, highways, bridges, buildings and drainage canal among others. Stone crushing industries contribute to the national FDP.

AIM

The aim of this study was to evaluate the safety of stone crushing on quarry workers using Liver and kidney function tests.

OBJECTIVES

The major objectives of this study were:

- ✓ to estimate the effect of some kidney and liver parameters on the quarry workers;
- ✓ to compare the parameters with individuals of the same age and sex (notality) who do not work at the same factory (control).

II. STONE QUARRYING

Stone quarrying is a multi-stage process by which rocks are extracted from the ground and Crushed to produce aggregates that are finally screened into their various sizes of use based on the demand. In Nigeria, quarrying started in the 19th century in several villages on the sandstone encampment near Dambatta Kano State (Warrel et al., 1977), have shown that number of health related problem could arise even under condition in which simple tools such as picks are used to quarry grind stones. Nigeria, like most developing countries is undergoing industrialization which has brought with it lots of health related problems. As workers are occupationally exposed to various hazards which affects them. The massive demand for quarry stone in building and road construction has led to the establishment of quarry industries in this part of the country without due regards to the occupational health and safety practices (WHO, 1972).

Rock dust constitutes environment nuisance as well as hazard due to its components which include the following:

Asbestos, coal, carbon, iron, and silica. Silica is the greatest in quantity. This dust has been categorized into: Fibro genic and insert rock dust. Fibro genic dust is composed of silica and asbestos and exposure to a high concentration of fibro genic dust causes lungs fibrosis. The insert rock dust has free silica content of less than 1% and it is usually perceived as harmless, with no effect on the lungs.

III. DAMAGING EFFECT OF QUARRY DUST ON THE LUNG TISSUES

Studies on the effect of high exposure to quarry dust have pointed out its effect on the respiratory system (Azah et al, 2002). Pneumoconiosis is the general name for group of lung diseases caused by inhalation of air born dust. It is implicated by these factors namely; Composition of the dust, dust particles and duration of exposure (Jones *et al.*, 1936). This pneumoconiosis has been categorized into two broad groups viz: silicosis.

A. SILICOSIS

Chronic inhalation of silica in its crystalline forms results to silicosis. Silica are dust particles whose sizes are less than 7 microns in diameter far too small to be seen by the human eye. Silica is abundant in nature and composes about 12% of the earth's crust. Silica is responsible for causing the oldest and most dreaded of occupational diseases, silicosis (Chattopadhya & Gangopadhyay, 2006). When these fine particles of silica dust are inhaled, they are deposited in the lungs and macrophages that ingest the dust particles will set off an inflammatory response by releasing tumor necrosis factors, interleukin-1 and other cytokines. In turn, this stimulates fibroblasts to proliferate and produce fibrotic nodules and scar around the trapped silica particles. If the nodules grow too large breathing becomes difficult and death may result and victims are at high risk of developing tuberculosis (Saures *et al*, 1938). The symptoms of silicosis include shortness of breath on exercising, dyspnea (difficultly in breathing) dry or sever cough often persistent and accompanied by coarseness of the throat chest pain and respiratory failure (Gardener *et al.*, 1933). Such irreversible damage to the lungs means that the lungs cannot perform their function of supplying oxygen to the blood as it should, because the silica dust has embedded itself deeply into the tiny alveolar sacs and ducts where oxygen and carbon dioxide gases are exchanged. This effect leaves the lung with solid nodules of scar tissue making the victim susceptible to lung infections (Harch *et al.*, 1940).

There has not been any cure discovered for this deadly diseases, hence the purpose of this research work has been geared towards exposing the danger of this inhaled dust on the lungs and how to prevent this complication and possibly stop further exposure to dust and other lung irritations. The long exposure to crystalline silica dust, especially at the point sources, and the many years they have worked in the aggregate quarries expose the workers to respiratory and pulmonary diseases and are also at high risk of developing silicosis (Langer et al 2004)

However, Hazardous dust in the work environment also contains cadmium (Ugbogu et al., 2009). High exposure to cadmium may cause kidney damage. Severe cadmium poisoning causes osteoporosis (Jarup et al., 1998; Jin et al., 2004; Olsson et al., 2005)

FACTORS IMPLICATED IN SILICOSIS

The most important factors in the development of silicosis are:

- ✓ The "does" of respirable silica contained in the dust of the work place setting i.e The concentration and percentage of respirable silica in the total dust.
- ✓ The crystalline or non-crystalline nature of the silica
- ✓ The particles size
- ✓ The varying period from first exposure to diagnosis (from several months to more than 30 years (Banks *et al.*, 1996).

TYPES OF SILICOSIS

A worker is predisposed to developing any of the three types of silicosis depending on the air borne concentration of respirable crystalline silica. Acute silicosis; this usually develops due to a high concentration of respirable crystalline silica and results in symptoms within a period ranging from a few weeks to 5 years after the initial exposure (Ziskind *et al.*, 1976).

Accelerated silicosis: this occurs within 5-10 years after the first exposure.

Chronic silicosis: this usually occurs after 10 years or more of exposure at relatively low concentrations.

B. ACID – BASE HOMEOSTASIS

According to Elkinton *et al.*, (1955) in general, the basic reason for regulation acid-base balance in health is to protect the PH from alterations induced by the continuous formation of acid and other product of metabolism. The PH of the extracellular fluid in a health individual is maintained at 7.35-7.45.

Under normal circumstances CO^2 production and excretion are matched and the usual steady state of PCO_2 is being maintained at 40mmHg. Under-excretion of CO_2 Produces hyper apnea (Hypoventilation) nevertheless production and excretion are again matched at a steady state PCO_2 therefore the PCO_2 is regulated primarily by renal respiratory factors and it is not subject to regulation by the rate of CO_2 production. Hyper apnea is usually the result of hypoventilation rather than that of increased CO_2 production (Fall 2000). Therefore any PCO_2 increase above or decrease below the normal value of 40mmHg represents derangement of natural respiratory control and are due to compensatory changes in response to a primary alteration in the plasma bicarbonate (HCO_3) and such is termed acidosis or alkalosis.

C. ACID BASE DISORDERS

This involves primary changes in PCO_2 or HCO_3 which alter systemic Ph. Acidosis is an abnormal process which produces acidaemia (a blood Ph less than 7.35) or would do so if compensation were to occur while alkalosis is an abnormal process which produces alkalaemia (a blood Ph above 7.45) or do so if no compensation were to occur.

Acidosis and alkalosis may be respiratory or metabolic in origin and by this; we enumerate the four different types of acidosis and alkalosis which include:

- ✓ Metabolic acidosis
- ✓ Metabolic alkalosis
- ✓ Respiratory acidosis
- ✓ Respiratory alkalosis

But for the interest of this work we shall be restricted to only two types of disorders

D. RESPIRATORY ACIDOSIS

Respiratory acidosis is due to inadequate elimination of carbon-dioxide (CO_2) by the lungs due to hypoventilation or uneven ventilation in relation to blood flow. This is found commonly in fibrosis, cardiopulmonary disease and respiratory muscle fatigue. As a result CO_2 concentration will increase and as such the Ph value will decrease. Invariably, ventilation or respiration activity will be stimulated immediately to quickly prevent further CO_2 accumulation (Dave port 1958).

There are two types of respiratory acidosis; Acute and chronic respiratory acidosis.

ACUTE RESPIRATORY ACIDOSIS:

This is associated with severe acidosis and only a slight increase in bicarbonate (HCO_3). After 6-12 hours the primary increase in PCO_2 evokes an immediate renal compensatory response to generate more HCO_3 due to cellular buffering mechanism which tends to ameliorate the respiratory acidosis this usually takes several days to complete (Dubose, 2004).

CHRONIC RESPIRATORY ACIDOSIS

This is generally seen in patient with underlying lungs diseases such as chronic obstructive pulmonary disease. In this type of respiratory acidosis, HCO_3 increases by 4mmol/L for every 10mmHg increase in PCO_3 (Singer *et al*, 1948). When chronic respiratory acidosis is corrected suddenly especially in patient who received mechanical ventilation there is 2-3 days lag in renal bicarbonates excretion (bicarbonateuria) resulting to post hypercapnic metabolic alkalosis.

In respiratory acidosis, the common laboratory findings have always been increased $paCO_2$ (although it's) rare for a compensatory increase in $paCO_2$ to exceed 55mmHg) HCO_3Clevel and decreased arterial Ph, Hypochloremia is usually observed in chronic respiratory acidosis (Epstein *et al*, 2006)

E. METABOLIC ALKALOSIS

This is characterized by elevated arterial PH. It is an increase in $paCO_2$ as a result of compensatory alveolar hypoventilation. It is often accompanied with hypochlorinemia and hypokalaeemia. (Galla 2000) patients with high (HCO_3) and low chloride (CI) have either metabolic alkalosis or chronic respiratory acidosis because same is seen in both but only the arterial PH that differentiates diagnosis for the two disorders as the former has high PH value while the latter has low PH value

Abnormalities that generate HCO_3 within the body are called initial factors of metabolic alkalosis, while

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abnormalities that promote renal conservation of HCO_3 are called maintenance factors metabolic alkalosis and still remain even after the initial factors have disappeared (Khanna *et al*, 2001). In metabolic alkalosis, the common laboratory findings is an observable increase in PCO_2, up to 6mmHg for each 10mmoIIL increase in HCO_3 above normal and from since there is a net gain of its CO_2 and loss of non-volatile acid from the extracellular fluid, then it is unusual to add alkali to the body this mechanism involves two stages: the generative stage in which there is loss of acid resulting to alkalosis and maintenance stage where by the kidneys fail to compensate by excreting HCO_3 because of volume contraction or depletion of chloride (CI). Since the kidney has the impressive capacity to excrete HCO_3 under normal circumstance therefore prolonged metabolic alkalosis is a clear evidence that the kidney has failed to eliminate HCO_3 in the usual manner and since it retains rather than excrete, the excess alkali in the body system maintain the alkalosis (Wessen, 2000).

Metabolic alkalosis can be manifested clinically as muscle cramps, mental confusion and cardiac arrhythmias. The usual laboratory findings are increased arterial blood Ph, HCO_3 arterial $paCO_2$ decreased serum potassium and chloride

TYPES OF METABOLIC ALKALOSIS

Metabolic alkalosis has been classified into two based on the chloride responsiveness and chloride unresponsive (Maikias *et al*, 2003). Chloride-Responsive alkalosis: this is a more common disorder by normotensive extracellular volume contraction and hypokalamia and less frequently orthostatic hypotension may be seen. It is a marker for volume status. This type can be generated through vomiting which leads to loss of stomach hydrochloric acid content (HCI) and as a result there is net gain of HCO_3 in the ECf. The latter will now obligate the renal excretion of sodium and gastric chloride ions. Volume concentration will ensure. Actually loss of the HCL initiates alkalosis while the volume concentration from the loss of CI ion sustains alkalosis because the decline in glomerular filtration rate causes a penal Na and HCO_3 reabsorption which increases proximally resulting to acidic urine despite alkalemia. Renal chloride ion reabsorption as well as Na+ reabsorption is high leading to low urinary chloride ion (< 10-20mEq/L) (Khanna 2001). Therapy for this kind of alkalosis is geared towards correcting extracellular volume deficit and on that note, adequate administration of 0.09% Nacl and kcl should be carried out depending on the degree of hypovolemia

CHLORIDE-UNRESPONSIVE ALKALOSIS

This chloride resistant type of disorder is a sign of volume expanded state (Medias *et al*, 2003). The primary hyperaldosteronism cause this extracellular volume expansion with hypertension. In an attempt to decrease extracellular volume, High levels of sodium chloride (Nacl) are excreted and for that reason the urinary CI is high (> 20 mEq / L. often higher). Metabolic alkalosis with hypokalamia usually results from the renal mineral corticoid effect. Therapy for this disorder using Nacl will only increase volume expansion and hypertension and will not treat the underlying problem of excess mineralcortcoid (Galla. 2000).

IV. MATERIALS AND METHOD

Description of the study area and collection:

This study was carried out on quarry workers in different sites within Umuoghara, Ezza north local government Ebonyi state, Nigeria. This study was carried out after the informed consent of participants were obtained individuals selected includes 50 exposed workers who have worked at the factory for at least three years before the study a control group was also chosen which constitute 50 non-quarry workers who have not been exposed to quarry dust in any way.

A. SAMPLE COLLECTION

Five mls whole blood was collected from the anterior vein located at the cubital fossa of each of the stone crushing workers and also from the controls the blood sample were transferred into lithium free heparine container and labeled properly the serum was obtained from the sample by centrifugation after allowing them to retract and clot properly.

B. METHOD

Well standard structured Questionnaires were used to collect data on the occupational profile of each of the workers as well as any occupation hazard which have been experienced such as dry cough, difficulty in breathing within the period of employment.

The parameters assayed were:

Electrolytes Na+ K+ CL+ using SFRI ISE

Liver function test AST ALT creatinine urea

Principle: The transaminases constitute a group of enzymes which catalyze the inter-convertion of amino acids and ∝-oxoacids by transfer of amino groups.

Principle for electrolyte: The analyzer utilizes ion selective electrode technology (ISE) ISE is a type of electrochemical sensor which converts the ionic activity to the electrode potential of the electrode.

Different electrode are sensitive to different ions activity for example sodium electrode is only sensitive to sodium ions and potassium electrode is only sensitive to potassium ion the key part of the electrode is the sensitive membrane, on one hand it is in contact with the sample and responds the changes of the concentration of certain ions in the sample on the other hand it is in contact with the internal filling solution and contacts and ionic conduction to the electronic conduction through a silver thread. The potential difference for the various electrode (Na+ K+, CL) are measured against a reference electrode plasma bicarbonate

Method adopted: manometric method

Principle of manometric method for the measurement of plasma Hco3

A fixed amount of the reaction reagent ® is added to the sample in the sealed chamber. Co2 the gas pressure sensor detects the changes and sends the signal to the micro -

processor to determine the amount of Hco3 ion in the sample. The concentration is displayed in the display screen

Operation of ISE analyser

The ISE SFRI analyser is an automated instrument and it is relatively easy to operate. The machine automatically calibrates the electrode and after which it is ready for use in sample analysis

The machine is operated from the display screen which is screen touch.

Procedure

- ✓ To analyze a sample hit the test option on the display screen the sample pro be will automatically come out from hibernation.
- ✓ Take on 5mls of the plasma and immerse it in sample probe then hit the “Run” option on the display screen the sample probe aspirates 150ul of the plasma of after which the sample almost is withdrawn. The sample is automatically analysed pod and the result displayed within 90 seconds on the display screen ALT (Alanine Aminotransfrase)

PRINCIPLE: alanine aminotransferase is measured by monitoring the concentration of pyruvate hydrazone found with 2.4 dinitrophylhydrazone.

Equation of reaction:

AST (Aspartate Aminotransferase)

PRINCIPLE: AST is measured by monitoring the concentration of oxaloacetate hydrazone formed with 2.4 dinitrophenylhydrazone

Equation of reaction:

UREA

PRINCIPLE: urea in serum is hydrolyzed to ammonia in the presence of urease. The ammonia is measured photometrically by bartholot’s reaction

Urea + H2o urease 2NH3 + CO2 NH3 + Hydrochlorite + pherolu indophenols (blow compound)

Equation of reaction:

CREATININE

PRINCIPLE: creatinine in an alkaline solution reacts with picric acid to from a coloured complex. The amount of the complex formed is directly proportional to the creatinine concentration.

C. STUDY DESIGN

A total of 100 subjects participate in the study.

Fifty subjects were the study subject who have involved at quarry factory for at least three years while so subjects served at control.

STATISTICAL ANALYSIS

Test of Hypothesis

The model is represented thus;

$$\text{T-cal} = SP\frac{\overline{\overline{X1}}}{\sqrt{\frac{1}{\overline{N1}}+\frac{1}{\overline{N2}}}}\overline{X2}$$

Where $\overline{X_1}$ = mean value of each test for quarry staff

$\overline{X_2}$ = mean value of each test for non-quarry staff

$N_{1=}$ Population sample of quarry staff

$N_{2=}$ Population sample for non- quarry staff

1 = universal constant, representing unity

$$sp = \frac{\sqrt{(N_1 - 1)(D_1)^2 + (N_2 - 1)(D_2)^2}}{(N_1 + N_2) - 2}$$

$D_{1=}$ Variance of mean of sample for quarry staff

$D_{2=}$ Variance of means of sample for non-quarry staff

DECISION RULE OF THUMB

If T – cal is greater than T – tab, reject null hypothesis, otherwise reject.

$H0_1$: Test of Difference in Urea Sample of Quarry and Non-quarry staff

In this section, the null hypothesis which states that there is no significant difference in the bio – accumulation of quarry workers and non-quarry workers was tested at both 1% 5% and 10% level of significance. Data were collected in respect to the urea samples of both 15 quarry staff named (X_1) and 15 non-quarry staff, named (X_2) in the area. The data collected were recorded as follows:

X1	4.3	3.0	3.1	3.1	2.7	3.3	6.2	4.3	4.1	2.5	2.6	1.1	4.2	7.9	5.8
X2	3.2	4.8	4.9	3.0	2.1	3.9	7.2	6.2	4.0	3.8	4.3	2.9	3.0	6.3	6.4

From the data given above, for X_1, the following are true;

$\overline{X_1} = 3.88$

D_1 = Standard deviation (1.64)

$N_1 = 15$

$\overline{X_2} = 4.40$

D_2 = Standard deviation (1.48)

$N_1 = 15$

$N_2 = 15$

$Df = N - 1 = 15 - 1 = 14$

After employing the formula earlier stated using the T-cal formula, it was observed that the T-cal (4.81) was greater than the T-tab (2.98) at 1% (2.14) at 5% level of significance and (1.76) at 10% level of significance. This implied that the null hypothesis which states there is no significance in the urea bio-accumulation of quarry workers and non-quarry workers was rejected and the alternative which states that there is significance difference in the urea bio-accumulation of quarry workers and non-quarry workers was accepted. The implication of this finding that there exists a statistical difference in the level of urea bio-accumulation of quarry workers from that of non-quarry workers;

This could be attributed to the level of exposure which quarry workers get while working in the quarry which emits some effluent gases.

$H0_2$: Test of Difference in Createnine Sample of Quarry and Non – quarry staff

In this section, the null hypothesis which states that there is no significant difference in the createnine bio-accumulation of quarry workers and non-quarry workers was tested at both 1%, 5% and 10% level of significance. Date were collected in respect to the createnine samples of both 15 quarry staff and named (X_2) in the area. The data collected were recorded as follows;

X1	68`	79	80	49	50	62	80	102	72	89	59	60	72	82	90
X2	78	65	83	78	46	71	103	59	102	75	79	75	89	119	110

From the data given above, for $X_{1,}$ the following are true;

$\overline{X_1} = 82.13$

D_1 = Standard deviation (17.59)

$\overline{X_2} = 72.93$

D_2 = Standard deviation (14.65)

$N_1 = 15$
$N_2 = 15$
$Df = N - 1 = 15 - 1 = 14.$

After employing the formula earlier stated using the T-cal formula, it was observed that the T-cal (8.1998) was greater than the T –tab (2.98) at 1%, (2.14) at 5% level of significance and (1.76) at 10% level of significance. This implied that the null hypothesis which states that there is no significant in the creatinine bio-accumulation of quarry workers and non-quarry workers was rejected and the alternative which states that there is significant difference in the creatinine bio-accumulation of quarry workers and non-quarry workers was accepted. The implication of this finding is that there exists a statistical difference in the level of creatinine bio-accumulation of quarry workers from that of non-quarry workers. This could be attributed to the level of exposure which quarry workers get while working in the quarry which emits some effluent gases during the course of its operations.

$H0_3$: Test of Difference in Alanine Amino Trasferase (ALT) Sample of Quarry and Non-quarry staff

In this section, the null hypothesis which states that there is no significant difference in the Alanine Amino Trasferase (ALT) bio-accumulation of quarry workers and non-quarry workers was tested at both 1% 5% level of significance. Data were collected in respect to the Alanine Amino Trasferase (ALT) samples of both 15 quarry staff and named (X_1) and 15 non-quarry staff, named (X_2) in the area. The data collected were recorded as follows;

X1	14	13	12	22	7	4	10	9	4	5	3	3	7	24	20
X2	5	5	9	3	3	10	7	5	9	7	14	10	5	10	9

From the data given above, for X_1, the following are true;
$\overline{X_1} = 10.47$
D_1 = Standard deviation (6.73)
$\overline{X_2} = 7.40$
D_2 = Standard deviation (2.98)
$N_1 = 15$
$N_2 = 15$
$Df = N - 1 = 15 - 1 = 14.$

After employing the formula earlier stated using the T-cal formula, it was observed that the T-cal (8.466) was greater than the T-tab (2.98) at 1% (2.14) at 5% level of significance and (1.76) at 10% level of significance. This implied that the null hypothesis which states that there is no significant difference in the Alanine Amino Trasferase (ALT) bio-accumulation of quarry workers and non-quarry workers was rejected and the alternative which states that there is significant difference in the Alanine Amino Trasferase (ALT) bio-accumulation of quarry workers and non-quarry workers was accepted. The implication of this finding is that there exists a statistical difference in the level of Alanine Amino Trasferase (ALT) bio-accumulation of quarry workers from that of non-quarry workers. This could be attributed to the level of exposure which quarry workers get while working in the quarry which emits some effluent gases during the course of its operations

$H0_4$: Test of Difference in Aspartate (AST) Sample of Quarry and Non-quarry staff

In this section, the null hypotheses which states that there is no significant difference in the Aspartate (AST) bio-accumulation of quarry workers and non-quarry workers was tested at both 1% 5%, and 10% level of significance. Data were collected in respect to the Aspartate (AST) samples of both 15 quarry staff and named (X_1) and 15 non-quarry staff, named (X_2) in the area. The data collected were recorded as follows;

X1	23	19	14	18	12	10	12	11	7	12	13	6	11	30	28
X2	10	6	14	9	6	18	16	9	3	9	15	13	14	16	14

From the data given above, for X_1, the following are true:
$\overline{X_1} = 13.60$
D_1 = Standard deviation (7.07)
$\overline{X_2} = 11.47$
D_2 = Standard deviation (4.2)
$N_1 = 15$
$N_2 = 15$
$Df = N - 1 = 15 - 1 = 14.$

After employing the formula earlier stated using the T-cal formula, it was observed that the T-cal (5.325) was greater than the T-tab (2.98) at 1% (2.14) at 5% level of significance and (1.76) at 10% level of significance. This implied that the null hypothesis which states that there is no significant difference in the Aspartate (AST) bio-accumulation of quarry workers and non-quarry workers was rejected and the alternative which states that there is significant difference in the Aspartate (AST) bio-accumulation of quarry workers and non-quarry workers was accepted. The implication of this finding is that there exists a statistical difference in the level of Aspartate (AST) bio-accumulation of quarry workers from that of non-quarry workers. This could be attributed to the level of exposure which quarry workers get while working in the quarry which emits some effluent gases during the course of its operations.

V. RESULT

In this research work, a total of 100 subjects were recruited for the purpose of the study. In which 50 subjects are quarry workers and 50 subjects were apparently healthy individuals (control subject from students' population. The results of the data obtained in the research worker are presented in the table below

Table I shows the levels (meant SD) of electrolytes (Na+ k+ cl-and HCO3) and urea in the serum of quarry workers and non-quarry workers among quarry workers in Umuoghara Ezza north L.G.A of Ebonyi state according to the above table, the mean and plasma electrolytes of study subject (Na+k+ Cl- and Hco3) which reads 139.73± 2.7mmo1/l, 103.46 ± 3.48mmol/l and 29.80 ± 2.80mmol/l respectively are greater than the levels of compounding electrolytes of control subjects 136.93 ± 2.0smol/l, 101.93 ±3.17mmol/l and 23.93 ± 1.83mmol/l for Na+ difference (0.03) between the two study group indicting significant and Hc03 respectively, also the p-values which are less than 0.05($p \geq 0.05$) shows that the difference between the plasma electrolytes levels of quarry workers and non-quarry workers is statistically very highly significant. This implies that the quarry dust red to the study of the quarry workers the electrolytes in the plasma of the quarry workers except for k+ and urea when compared at a very high significant level also the p-value which are less than 0.05 ($p < 0.05$) shows that the difference between the plasma electrolyte levels and urea of quarry workers and non-quarry workers is statistically corroborates the works of Oguntoke, Aboaba & Obadebo (2009) who reported that the health problems suffered by the quarry workers are due to inhalation of quarry dust which are deposited in the air This health problems include nasal infection, catarrh, cough, hypertension, silicosis asthma among others. In the same vain, Ogontoke et al (2009) report that environmental risk indicates that in any settlement, human beings are influenced artificial factors in such as extent that indicators of ill-health can be interpreted by considering their living conditions and lifestyle characteristics Enger & Smith (2002) also reported that the altered environment so created exposes humans to backward repercussion which causes an aggravate of certain illness and emergence of new ones. Individuals with lung diseases such as bronchitis, emphysema, chronic obstructive pulmonary disease can be aggravated by quarry dust exposure (Ahmed & Abdullah, 2012).

Parameter electrolytes	Quarry workers (qw) (N= 50) (mean± S.D)	Non-quarry workers (NQW) (N=50) (mean ± S.D)	P-Values
Na+ (mmol/l)	139.73 ± 2.71	136.93 ± 20s	0.000 (*)
K+ (mmol/l)	1.92 ± 0.19	3.92 ± 0.39	0.000(*)
cl- (mmol/l)	103 – 46 ± 3.48	101.93 ± 3.17	0.014(**)
Hco3 (mmol/l)	29.80 ± 2.80	23.93 ± 1.83	0.001(*)
ur (mmol/1)	3.88 ± 1.71	4.40 ± 153	0.003 (*)

Table I: Biochemical Profile of the Study Subjects

This in line with the findings of Sharnnon & Spurlock as posited by Ogontoke et al, (2009) that the regularity of the individuals' interaction with zones of varying hazards determines their possibility of contacting diseases.

Cohend effect size interpretation (Decision point) 0.2 = small effect size, 0.5 = medium effect size, 0.8 = large effect size.

The result in Table I shows that the cohens'd of the electrolyte (Na+, K+. cl-) have the values -7 94, -5.63 and -0.72 respectively. This implies that Na+, K+ and Cl- from the non-quarry workers has a small effect size to the Na+, K+ and Cl- in the plasma of the quarry workers meanwhile, the cohen'sd of HCO_3 has a value of 1.35. This implies that the HCO_3 from the quarry dust has a large effect size to the Hco3 in the serum of the non -quarry workers. The P- value of the electrolytes, Na+, K+ Cl- and Hco3 (p< 0.05) is statistically very highly significant. This implies result of the cohen'sd of the electrlytes and urea is statistically retable and justifiable. This is in line with the finding of Ogontoke et al, (2009) that the effects of dust emission from quarries have both micro and regional dimensions. He further stated that this emission on noxious gases have negative impacts on human health of the emission is on the human being cenger et, al, 2002. However, last (1998) started that once the particles of varying chemical conpositions are inhaled, they lodge in human lungs thereby causing lung damages and respiratory problems. The large effect is on Hco3 of the quarry workers which is characterized by increase in serum bicarbonates. This is why galla (2000) stated that patient with high Hco3 have metabolic alkalosis which is seen as a disorder which result to high PH values.

P < 0.1 = statistically significant
P < 0.0s = high significant
P < 0.01 = very high significant

The result from Table I showed the mean values and standard deviation of Cr, Alt and Ast for quarry workers as 82.13 ± 19.67, 10.47 ± 6.7 .10.47 ± 6.97 and 15.07 ± 716, respectively but, that of non-quarry workers were 72 93± 15.16, 7.40 ± 3.09 and 11.47 + 4.39.

The result showed that the mean values of Cr, Alt and Ast of Qw were greater than those of NQW. But the standard deviation derived from all the parameters for QW were higher than those of NQW.

This implies that exposure to dust which contains heavy metals like lead, silicon etc. are most likely to increase the values of Cr, Alt and Ast. This is be case when the dust are inhaled the liver which main function is detoxification will be over labored as they are trying to do toxify the system (remove the toxins) this directly increases the value of liver function test.

Further observation showed that the results of between QW and NQW were statistically (P< 0.0s) whole those of Alt and Ast showed statistical significance at (P< 0.01) this means that Alt and Ast were very highly significant, whereas Cr was highly significant.

This means that the quarry dust adds positively to the above mentioned values. This further exposure of the costly workers to dust in the study area will further increase the values obtained from this study. This study has shown that there was a general depression in the liver function parameters of so many factory workers. Compared with those of the control subjects, the result of the present study is in agreement with the study of comment dust on hematological and hvm-function tests parameters.

VI. CONCLUSION

The results suggest that the liver may be adversely affected by quarry dust exposure. Arise in the liver enzymes. Generally suggests a lesion in the liver. The results of the present study suggest that chronic exposure to quarry dust has deleterious effect on the hemopietic system. Those quarry dust exposure may be more this finding was strengthened by the reported gonotoxic effect seen in people occupationally exposed to cement dust. Such genetic damage comprised of minor- chromosomal aberration. Decrease in mitotic index and increased frequency of sister chromatid exchange guide et al (2002)

Damage comprised of minor chromosomal aberration, decrease in mitotic index and increased frequency of sister chromatid exchange guide et al (2002). The health impacts of working in stone quarrying industry have been well documented Oxman et., al. (1993). For instance, numerous epidemiological studies have supported the association between respiratory impairment and occupational exposure to dust. Again, individuals working in dusty environment have been found to carry the risk of inhaling particulate materials (e.g, silica) that may lead to adverse respiratory effects park (2007). Such as chronic bronchitis, emphysema, acute and chronic silicosis, lung cancer among others (Kasper et., al. 2008). Which are disabling and can even be fatal. Also, high prevalence of silicosis has been reported among workers engaged in quarrying shale sedimentary rock in India.

According to Urom, et al., (2004) the major respiratory symptoms among quarry workers include non-productive cough, chest pain, catarrh and dyspnea. Considerable pulmonary function impairments have been reported in quarry workers malmberg et., al (1993) and Tsin et., al. (1987). In a study by Ghotkar et al. (1995), the prevalence of respiratory morbidity among stone quarry workers was 32.5%, based on radiological study.

Silica is also a major component of quarry dust silica exposure was described as being associated with renal insufficiency. Increase in creatinine level in this study suggests the toxic effect of quarry dust in the test group. The elevated levels AST and ALT activity suggest that workers are more susceptible to hepatic damage, and this rise generally suggests that there is a lesion in the liver. In the study, urea is not affected significantly, indicating that the exposure of quarry dust does not have significant effect on the urea levels.

VII. RECOMMENDATIONS

Having seen the pathetic conditions that these quarry workers are being exposed to due to ignorance, I therefore recommend that:

The Federal Ministry of Solid Minerals should make urgent effort to institute and enforce measures to prevent the occupational health hazards enumerated in this study since it constitute a menace to workers, and combating this hazards requires a multi-disciplinary approach and special attention to the elimination of the dust which is the main sources of these hazards from the work environment of the quarries. Through this, environmental sustainability should be a part of the Millennium Developmental Goal.

Most importantly, is the need to educate the management and workers. By so doing many occupational hazards would have been averted if also all the workers in all the professions are given “basic” orientation on the principles of occupational health hazards.

The management of quarry industries needs to provide recreational facilities, appropriate safety devices and preventive measures to its workforce. The government should make a provision of protective gadgets to prevent the heavy metals from accumulating in the body which would result in accumulation of toxins in the body. Also from the result obtained, it is recommended that routine tests be carried out on the workers to access the liver and kidney functions. Again, there should be a modernization of machinery and all the materials used in the extraction and cutting of some in order to reduce the risk of occupational accident and improve productivity. There should be training of workers on accident and occupation disease prevention and on emergency rescue and safety techniques.

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