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EFFECT OF AGE ON ANTHROPOMETRIC, LUNG FUNCTION AND BLOOD PRESSURE PARAMETERS AMONG QUARRY WORKERS IN AKAMKPA L.G.A OF CROSS RIVER STATE, NIGERIA

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ABSTRACT

Population increase coupled with the rise in demand for construction materials like granite and gravels have necessitated the continued growth of quarry activities in and around Akamkpa LGA. This research work was conducted to ascertain the effect of age on anthropometric, lung function and blood pressure parameters among the quarry workers of Akamkpa. Observation, experimental studies and historical methods were used. A structured questionnaire and the vitalograph chart containing the spirograms of each of the workers. A calibrated aneroid sphyngmanometer (SF 60502) was equally used. Among the test subjects, the anthropometric, lung function (Except FEV_I %) and blood pressure parameters were all significantly (P<0.01) dependent on age. The reverse is the case with the control subjects where all the anthropometric lung function showed no significant when compared to age of workers, but the blood pressure parameters were all significantly (P<0.001) dependent on age. And recommended that aged persons should not be expose nor engage in prolong hard job like quarrying.

Key Words: Appraisal, Age, Anthropometric, Quarry, Effect, Workers, Akamkpa

INTRODUCTION

In Nigeria like other Third World Nations of the world, the quest for industrialization has increased tremendously in recent years. This industrialization depends greatly on environmental resources exploitation, such as granites and its utilization. Nigeria and Akamkpa in particular is blessed with abundant mineral resources which have contributed immensely to the national wealth, with associated socio-economic benefits. Regrettably, the process of extraction and processing this mineral resources (quarrying), invariably impact on the environment with a corresponding effect on human health. Before these minerals are harnessed, they have to pass through the stages of exploration, mining and processing. Different types of environmental damage and health hazards inevitably accompany the three stages of mineral development (Adekoya, 2003; Aigbedion, Iyayi, 2007 and Nwibo and Ugwuja, 2012).

The areas where mineral extraction is carried out are most especially vulnerable to serious health and environmental problems. They have created localized landscapes that are often aesthetically displeasing and frequently hazardous, leading to air, land and water pollution that can have far-reaching environmental and health effects. The fact is that, the situation is not supposed to be within the context of sustainable development as industrialization should not result to environmental doom, with its resultant consequences on the health of workers while providing economic boom to investors and manufacturers. Furthermore, respirable dust particles in the air cause a lot of havoc on the respiratory system as well as other systems of the human body (Wang, Yano, Nomaka, Wang, and Wang, (1997); Horak, Studnocka, Gartner, Neumann, Tauber, Urbanek, Veiter, and Frischur, 2000). Numerous studies have shown that environmental pollution, exposure to toxic fumes and industrial gases in urban areas, organic and inorganic dust exposure in rural areas, may be responsible for the precipitation of pulmonary function impairment in humans (Townsend, Enterline, Sussman, Bonney, and Rippey, (1985); Malenka, Hessel, Yosshida, and Enarson, 1999). Many industries in Nigeria emit a lot of dust which when inhaled, cause lung function impairment and pneumoconiosis, (Oberdoster, Osim, Tandaryi, Chinyanyua, Materira, Mudanmbo, Ferm, Finkelsterin, and Soderholm, 1992).

In adult life the function of the lung deteriorates with increasing age. This changes is the result of a number of factors, some of which are a deterioration in the tissues of which the lung is composed; a reduction in the strength of respiratory muscle and an increase in stiffness of the thoracic cage (Mu'awiyyah, Sufiyan, Olushola, Ogunleye, 2013). The intrapulmonary changes are probably due in part to an impairment of the nutrient blood supply from the bronchial arteries, a diminished permeability of cell membranes and alteration in the molecular structure of the collagen and other tissue (Cotes, 1978). The loss of elastic recoil that occurs with increasing age weakens the force which prevents the closure of the respiratory bronchioles during expiration. In men, there is increase in residual volume, and in women total lung capacity tends to diminish (Pierce and Ebert, 1965). In both sexes the residual volume as a percentage rises and the vital capacity (VC) decrease (Cotes, 1978). The exchange of gas across the alveolar capillary membrane is affected by the lung tissue which is one facet of aging. The loss reduces the surface area available for gaseous exchange. At this time the volume of blood in the alveolar capillary diminish but to a small extent. These changes give rise to a reduction in the diffusion capacity or transfer factor (Cotes and Hall, 1970).

Growth from childhood to adulthood causes increase in height as well as in size of the lung, hence increase in lung volume (Guyton and Hall, 1996). Aderele and Oduwole (1983) showed that peak flow rate of some healthy Nigerian children was higher in males than in females at age 4-10 years and higher in females than males age from 11-15years (Aderele *et al*., 1983).

There are ample experimental evidence that specific disorders such as cardiovascular disease, annoyance, speech interference at work and at home, and sleep disturbance can occur due to exposure to noise. Noise can also result in some psychological and non-specific disorders. Temporary and even permanent impairment to hearing can also result from prolonged exposure to excessive noise. Ising *et al.* (1980) showed that decrease of working quality, increase of psychical tension, increase of blood pressure and pulse frequency, and biochemical effects such as increase of epinephrine, urine and protein. There are different noise levels of discomfort for different people. Generally, the human level of discomfort starts from about 100 dB pain to about 120 dB, and damage to the ear drum will occur at 160dB.

Henderson, (1976) found out that exposure to high levels of environmental noise may accelerate loss normally due to aging. A study conducted by Rosen among the primitive Mabaan of the African Sudan, where their environment was almost free from noise with a typical background level of 40dB(A), showed that the hearing acuity of men in their seventies and eighties was equal to that of a healthy child at as age of ten (Rosen, 1987). The findings suggest that the Mabaan shows little, if any, hearing loss due to aging (presbycusis). The implication of these findings is that much of the hearing loss observed with age in industrial countries could really be due to environmental noise exposure (sockrcusis) rather than aging (presbycusis).

In recent years, attention has been directed towards investigating the possible effects of chronic exposure of noise on health, especially on the cardiovascular system and the risk of hypertension. This is a sustained elevation of the systemic arterial pressure. It is when the mean arterial pressure (MAP) is greater than the upper range of the accepted normal measure (Kirkendall *et al*., 1981). The normal mean arterial pressure is 90mmHg and when it is greater than 110mmHg, it is considered to be hypertensive. The recent increasing need for quarrying materials without adequate attention on the health and safety of workers gave rise to this research work. The objectives of this study were to ascertain the effect of quarrying on lung function and blood pressure rise of workers; and assess the effect of age on lung function and blood pressure parameters of quarry workers

MATERIALS and METHODS

Study area

The study area is Old Netim in Akampa Local Government Area of Cross River Sate. It lies between latitudes 05^0 00'N and 5^0 57'N and Longitudes 08^0 06'E. Akamkpa Local Government Area is bounded to the North by Yakurr, Etung and Obubra Local Government Areas, Odukpani to the South, Biase Local Government Areas to West and the Republic of Cameroon to the East (Figures 1 & 2). This study involves human study and thus adopted observational, experimental and historical methods. Instruments used to conduct the test on the subjects include; vitalograph chart containing the spirograms of each subject. Ventilatory parameters include; Forced Vital Capacity (FVC); Forced Expiratory Volume in one second (FEV_1); Peak Expiratory Flow Rate (PEFR) and Force Expiatory Volume in one second as a percentage of forced vital capacity (FEV1%). A calibrated aneroid sphyngmanometer (SF60502) was used for blood pressure (Bp) level test. In addition, a structured questionnaire was equally used. A sample size of 254 subjects were used out of which 174 were used as quarry workers while 84 were selected from the control site at Iyamoyong community of Obubra Local Government Area.

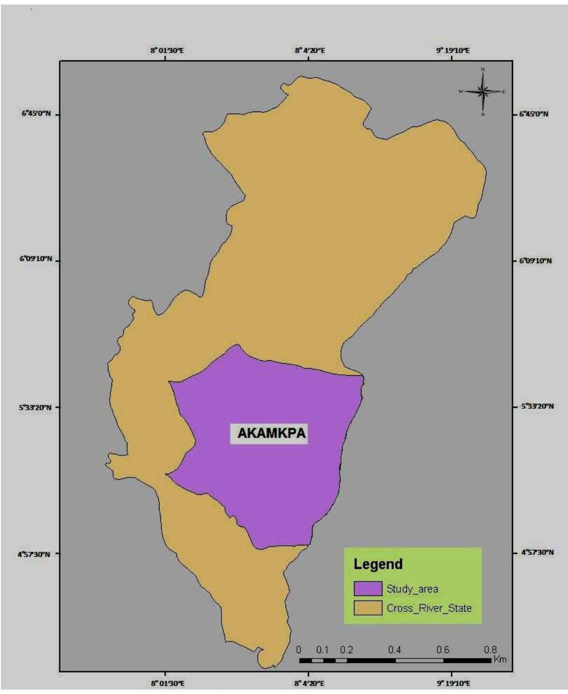

Figure 1: Cross River showing the study area
Source: GIS Unit, University of Calabar, 2012

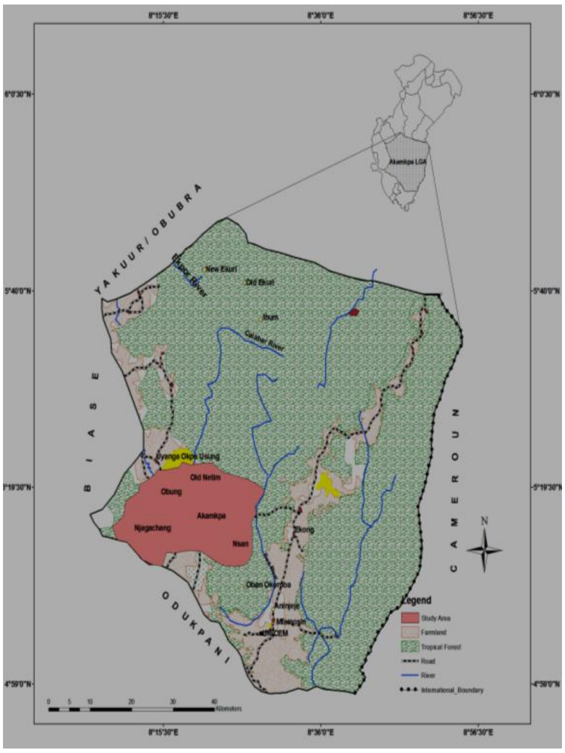

Figure 2: Akamkpa LGA showing the study area
Source: GIS Unit, University of Calabar, 2012

RESULTS AND DISCUSSION

Table 1 shows the distribution of workers on the basis of job disposition.

Table 1: Distribution of workers on the basis of job disposition

S/N	Industry	Crushers	Adm/Acct	Security	Mechanics	Medical/ Clinic	Blasting/ Operators	Cleaners	Drivers	Welders	(Electricians) and Others
1	Bergers	30	6	19	6	8	36	6	12	10	5
2	Setraco	25	12	18	8	2	20	4	13	7	4
3	Hitech	23	7	20	10	1	21	4	6	6	4
4	Arab	16	14	15	13	1	20	2	4	4	3
5	Crush Rock	22	8	16	9	2	24	3	7	5	5
6	RCC	32	10	18	8	0	22	7	19	9	3
7	Prodeco	23	5	14	7	1	18	4	8	5	3
8	Zenith	18	7	13	6	0	19	2	5	4	3

Source: Fieldwork (2012)

Table 2: Exposure to quarry noise and dust

Variables	Characteristics	Frequency	(%)
Duration of exposure	2-5yrs	17	20.2
	6-10yrs	51	60.7
	11yrs and above	16	19.1
Intensity of exposure	1-4hrs continuously	4	4.8
	5-8hrs	68	80.9
	9hrs and above	12	14.3
Knowledge of health impact	Yes	74	88.1
	No	10	11.9
Total		**84**	**100**

Source: Fieldwork (2012)

Duration, intensity and knowledge of health impact of exposure to quarry noise and dust is shown in Table 2. Out of the eighty four workers used in this study, seventeen (20.2%) had 2-5 years exposure, fifty one (60.7%) had 6-10 years while sixteen (19.1%) workers were exposed for 11 years and above to the quarry hazards. Intensity of exposure reveals that twelve (4.8%) were continuously exposed for nine hours and above daily, sixty eight (80.9%) were exposed for between 5-8 hours while four (4.8%) were exposed for between 1-4 hours continuously. Concerning the knowledge of health impact of exposure to quarry hazard, seventy four (88.1%) said that they had a pre-knowledge of the health implications while ten (11.9%) did not. Comparing anthropometric indices with lung function and blood pressure parameters of control males in Table 3 reveals that blood pressure parameters were significantly ($P<0.01$) influenced by age, while lung function parameters were not. However, the result in Table 4, reveals that both the blood pressure and lung function test parameters except for FEV_1 were all significantly ($p<0.001$) influenced by age. The relationship between anthropometric, lung function and blood pressure parameters among test females in Table 6 reveals that anthropometric indices of age, when compare with lung function and blood pressure parameters, shows no significance. This may be associated with their unit of operation, intensity of exposure among other non physiological parameters. The result of this work reveals that majority of the work force function as crushers, blasting and operators, thus exposing them to serious health risk. Regarding duration of exposure, 51(60.7%) had 6-10years while 16(19.1%) of the workers were exposed for 11years and above to quarry hazard. On intensity of exposure, 80.9% had 5-8 hours of continuous exposure.

Table 3: Effect of age on anthropometric, lung function and blood pressure parameters in control subjects

Age group	Control subjects	FVC	FEV_1	FEV_1	PEFR	SBP	DBP	MAP
Years	(n=174)	L	L	%	(L/min)	(mmHg)	(mmHg)	(mmHg)
10-20	46	3.87±0.16	3.11±0.15	79.75±1.83	484.70±14.11	103.04±0.87	72.07±1.20	82.39±0.88
21-30	68	3.96±0.13	3.22±0.13	80.65±1.35	501.30±8.31	105.01±0.96	74.72±1.05	84.82±0.87
31-40	40	3.74±0.17	3.00±0.14	80.37±1.46	505.85±13.40	111.63±1.52	77.95±1.11	89.17±0.79
41-50	20	3.92±0.31	3.12±0.25	79.73±2.59	502.90±6.32	121.40±3.22	79.30±1.21	93.33±1.45
F-test		0.369	0.385	0.077	0.562	24.856	5.993	18.129
P		(NS)	(NS)	(NS)	(NS)	(P<0.001)	(P<0.001)	(P<0.001)

Source: Fieldwork (2012)

Table 4: Effect of age on anthropometric, lung function and blood pressure parameters in test subjects

Age group	Test subjects	FVC	FEV_1	FEV_1	PEFR	SBP	DBP	MAP
Years	(n=84)	L	L	%	(L/min)	(mmHg)	(mmHg)	(mmHg)
18-20	25	2.84±0.12	2.16±0.12	75.86±2.29	438.96±8.72	109.20±1.70	76.00±1.87	87.07±1.42
21-30	50	3.59±0.12	2.82±0.10	78.70±1.44	507.20±10.03	121.06±1.52	82.00±1.03	95.02±0.90
31-40	6	3.26±0.41	2.61±0.39	78.53±3.78	483.61±28.33	122.50±4.03	85.00±1.83	97.50±1.47
41-50	3	2.90±0.34	2.13±0.39	72.44±5.24	457.67±15.34	136.67±3.33	86.67±1.67	103.33±0.00
F-test		5.263	5.485	0.670	6.690	11.983	4.726	12.552
P		(P<0.01)	(P<0.01)	(P<0.01)	(P<0.01)	(P<0.01)	(P<0.01)	(P<0.01)

Source: Fieldwork (2012)

Table 5: Relationship between anthropometric, lung function and blood pressure parameters in control subjects

Gender	Control	FVC	FEV_1	FEV_1	PEFR	SBP	DBP	MAP
	(n=172)	L	L	%	(L/min)	(mmHg)	(mmHg)	(mmHg)
Females	52	0.159	0.300*	0.282*	0.346*	0.104	0.233	0.234
Males	122	0.159	-0.204*	-0.166	-0.100	0.653**	0.313**	0.588**

*Correlation is significant at P<0.05; **Correlation is significant at P<0.01

Source: Fieldwork (2012)

TABLE 6: Relationship between anthropometric, lung function and blood pressure parameters in test females

Test females	FVC	FEV1	FEV1	PEFR	SBP	DBP	MAP
No.	L	L	%	(L/min)	(mmHg)	(mmHg)	(mmHg)
17	-0.430	-0.270	0.188	-0.072	0.343	0.084	0.222

Source: Fieldwork (2012)

As to whether the workers were knowledgeable on the health implication of the hazardous nature of the environment, 74(88.1%) accepted having a pre-knowledge, while 10 (11.99%) claimed ignorant of the health implication associated with the quarry working environment. Correlating age to health status shows that age does not have a strong influence on the anthropometric lung function of the control subjects, while in the case of correlating age to blood pressure (BP), it reveal a significant relationship (p<0.001), meaning that age influences the level of blood pressure rise of control subjects especially during noisy operation. This is clearly shown in Table 1. In the case of relating the effect of age on anthropometric, lung function and blood pressure parameters among the test subjects, the result reveals that both the anthropometric lung function and blood pressure parameters were all significantly (p<0.001) affected by age of the subjects, except FEV_1% which was not significant. This implies that as the worker advances in age coupled with the hazardous working environment, the lung function and blood pressure parameter are likely to be affected.

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