



LUNG FUNCTION AND SYMPTOMS AMONG QUARRY WORKERS IN KANO

Salim, M. A.

Department of Human Physiology, Faculty of Basic Medical Sciences
College of Health Sciences, Bayero University, Kano
zafaralisalimm@gmail.com, Phone: +2348033265554

Abstract

Background: Thousands of people are working daily in quarries in Kano, in a dusty environment. They are exposed to many types of health hazards such as organic and inorganic dusts which are risk factors in developing lung diseases. Quarry workers are exposed to high level of dust generated at quarry site.

Objective: The present study was designed to assess the effect of exposure to various dusts in quarry site on lung function.

Methods: Lung Volumes and Capacities were studied in 50 male quarry workers and 50 male control subjects. All participants were non smokers. The subjects were matched for age, height and weight. The lung function test was performed using an MIR Spirolab III and results were compared by student's unpaired t-test.

Results: The results of the study showed significantly lower mean values of FVC, FEV, % FEV/FVC, PEF. Similarly, there was also higher prevalence of back pain (43.5%, vs 5.0%; $P < 0.001$), catarrh and sneezing (6.0% vs 0.5%; $P < 0.001$), chest pain (13.5% vs 5.0%; $P < 0.001$) and cough (27.5% vs 11.0%; $P < 0.001$).

Conclusion: Based on the result of this study it may be concluded that quarry workers in Kano are at increased risk of developing occupationally related pulmonary impairment. It is recommended that a compulsory use of personal protective equipment by quarry workers at work place.

Key words: Lung function test, FVC, FEV, PEF, Quarry workers.

INTRODUCTION

The work place environment affects the health of workers. Individuals working in dusty environment face the risk of inhaling particulate materials that may lead to adverse respiratory effects (Park, 2007). Occupational exposure to dust is a well – known phenomenon, especially in developing countries (Fatusi *et al.*, 1996, Olusegun *et al.*, 2009). The health impacts of working in stone quarrying have been well documented (Oxman *et al.*, 1993, Nwibo *et al.*, 2012). Individuals working in stone quarry industry

environment have been found to carry the risk of inhaling particulate materials (e.g. silica) that may lead to adverse respiratory effects. Such as chronic bronchitis, emphysema, acute and chronic silicosis, lung cancer, etc (Park, 2007, Kasper *et al*, 2008). Nwibo, *et al* (2012) reported that, the major respiratory symptoms observed among quarry workers include chest pain, occasional cough, wheezing, shortness of breath and sputum mixed with blood other symptoms according to Urom, *et al* (2004) include chest pain, non-productive cough, catarrh and dyspnea.

Citation: Salim M.A (2016): Lung Function And Symptoms Among Quarry Workers In Kano. BJMLS, 1(1): 34 - 39

Lung Function and Symptoms

Every year, there are 50 million cases of occupational respiratory diseases caused by inhalation of toxic dust and chemicals, which are allergenic and carcinogenic agents (Park, 2007). A lot of dust and gases are generated in rock crushing and mining industries. Precautionary measures against inhalation of dust at the rock crushing sites are generally poor or nonexistent owing to lack of resources by the management of the industries and ignorance of the rock crushers. Once particles of varying chemical compositions are inhaled, they lodge in human lungs; thereby causing lung damages and respiratory problems (Last, 1998). The dusts generated from granite quarrying contain 71 percent silica. Inhaling such dust results in silicosis which is capable of disabling an exposed person and subsequently, leads to death. Apart from silicosis, sandblasters, miners and quarry workers are to suffer from pneumoconiosis (Tsin *et al*, 1987). Lung impairment is most likely due to the deposition of dust in the lung and are influenced by the type of dusts, the period of exposure, the concentration and size of the airborne dust in the breathing zone (Park, 2007)

In most developing countries including Nigeria stone quarrying is an unorganized sector of industry. There is high demand for stone quarry products from different sectors of the growing economy, coupled with high level of unemployment, poverty lead to different categories of the population indulging in the occupation. Specific professional training and government control; safety measures are almost absent. Pulmonary problems among quarry workers have been reported in Calabar, Ogun and Ebonyi States (Urom, *et al* 2004, Olusegun *et al.*, 2009 and Nwibo *et al.*, 2012). Despite the involvement of thousands in the trade, the implication of the health hazards among quarry workers had not been studied in Kano. The study is conducted to

determine the impact of occupational dust exposure on lung function among quarry workers in Kano.

Materials and Methods

Two groups of subjects comprising quarry workers (Test) and control groups were studied. Both the test and control groups comprised of men who work and lived in Kano metropolis in Kano State of Nigeria.

Test Subjects

Fifty male workers in stone crushing site located at Kano metropolis, aged between 12 to 50, who had worked at the site for between two to 10 years, were included in the study. Workers with clinical abnormalities of vertebral column and thoracic cage, anemia, diabetes mellitus, hypertension, tuberculosis, bronchial asthma, chronic bronchitis, emphysema, other respiratory diseases and smokers were excluded

Control Subjects

A total of fifty apparently healthy male subjects were used as control for this study. They were

Bank workers and civil servants engaged in non-dusty occupations. The anthropometric parameters (age, height and body weight) of the control group were also matched (similar) to the test (dust – exposed) group.

The protocol of the study was reviewed and approved by Scientific and Ethical committee of the Kano State Ministry of Health, Kano. Written informed consent was obtained from all the participants.

Procedure

Subjects were called in groups and instructed on the test procedure. A respiratory disease questionnaire was administered to all subjects before the test was performed.

The questionnaire recorded names, length of service, and smoking habit; any history and weight were measured and recorded. Spirometry was carried out using computerized Spirolab III.

The parameters measured were forced vital capacity (FVC), forced expiratory volume in one second (FEV₁), % FEV/FVC, peak expiratory flow rate (FEP).

Statistical Analysis

Generated data were collated and cleaned using Microsoft excel while analysis was done using the statistical package for social sciences (SPSS) version 20. The students' unpaired t- test was used to compare the means of test and control values. Chi-square test was used to test for significance between

two proportions. AP- values that was less or equal to 0.005 was taken as statistically significant. Fisher's exact test was used for statistical association and data is presented as mean and standard error of mean.

RESULTS

Table 1. Shows the comparison of mean values of anthropometric parameters between the control and the test groups. There were no significant difference in anthropometric parameters between the test and the control groups.

Table I. Comparison of anthropometric parameters between quarry workers and control subjects

| Parameters | Control subjects (Mean + SEM) n = 50 | Quarry Workers (Mean + SEM) n = 50 | P |
|----------------------------------|--|--|----|
| Age (Years) | 30.92 ± 0.71 | 30.11 ± 0.71 | NS |
| Height (cm) | 63.95 ± 1.4 | 64.43 | NS |
| Weight (kg) | 1.69 ± 0.01 | 1.68 ± 0.01 | NS |
| Mean BMI (kg/m ²) | 22.50 ± 0.48 | 22.50 ± 0.24 | NS |

NS = not significant

P = significance level.

BMI = Body Mass Index

Table 2 shows the comparison of the mean values of the lung function parameters between the control subjects and quarry workers. The test group had statistically significant lower values for all the lung function parameters studied as compared to the control group

Table 2. Comparison of the overall lung function between Quarry workers and control subjects

| Parameters | Control Subjects (Mean ± SEM) n = 50 | Quarry Workers (Mean ± SEM) n = 50 | P |
|---------------------------|--|--|--------|
| FVC (litres) | 6.84 ± 0.21 | 4.52 ± 0.32 | 0.0001 |
| FEV ₁ (litres) | 6.60 ± 0.33 | 3.68 ± 0.14 | 0.0001 |
| FEV ₁ /FVC % | 95.50 ± 2.12 | 80.40 ± 2.00 | 0.0001 |
| PEF (litres) | 7.50 ± 0.20 | 5.20 ± 0.28 | 0.0001 |

Lung Function and Symptoms

Table 3 Shows association between mean lung parameters and duration of exposure. There was a significant decrease in FVC, FEV₁ /FVC % and PEF among those working in quarry's for six or more years compared to those that work for five or less years..

Table 3. Association between mean lung function parameters and exposure

| Years of exposure | FVC Mean $\pm SE_p < 0.0001$ | Mean FEV ₁ $\pm SE_p < 0.0001$ | Mean FEV/FVC% $\pm SE_p < 0.0001$ | Mean PEF $\pm SE_p = 0.026$ |
|---------------------------------|------------------------------------|---|---|-----------------------------------|
| One to five years N=20 (40%) | 4.87 ± 0.29 | 4.02 ± 0.26 | 84.46 ± 1.85 | 5.39 ± 0.34 |
| Six or more N=30 (60%) | 3.58 ± 0.10 | 2.76 ± 0.10 | 75.63 ± 1.76 | 5.39 ± 0.34 |

Fig.1 shows the comparison of the prevalence of respiratory and non respiratory symptoms between test and control subjects. The test groups have significantly higher prevalence of respiratory symptoms than the control groups.

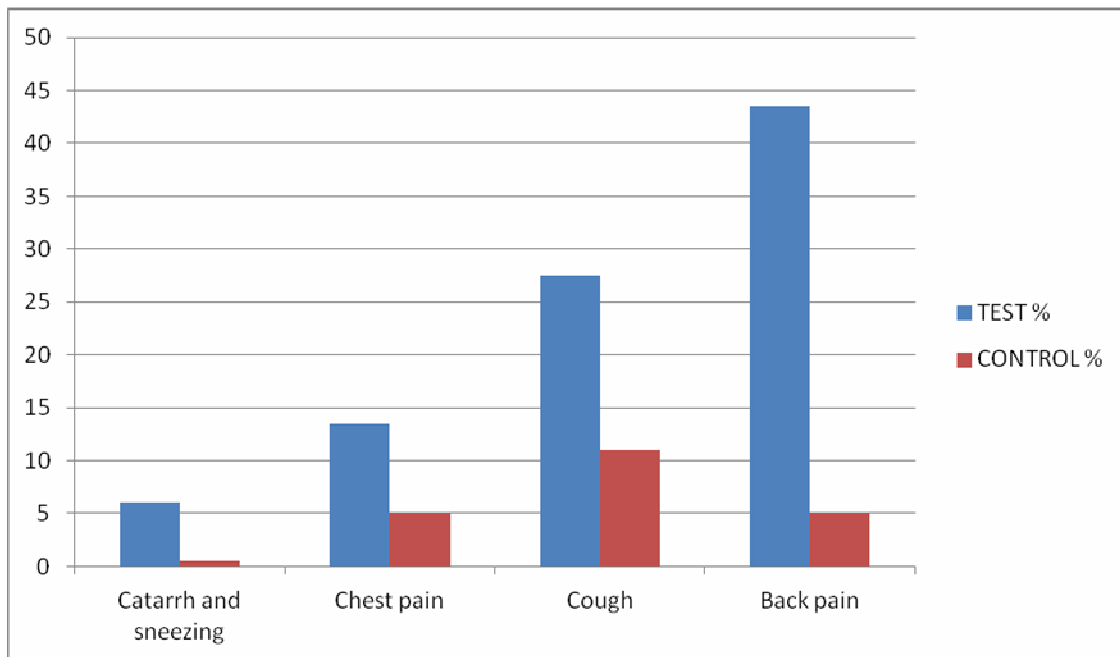


Figure 1. Prevalence of Respiratory Symptoms among Quarry Workers and their control

Discussion

The mean lung function values FVC, FEV₁, FEV₁ /FVC % and PEF for the control group obtained in this study were similar to the normal values reported for males by other investigators (Osim and Esin, 1996). These values therefore showed that the control group that participated in this study were apparently healthy Nigerian men.

The control and the test groups have mean values of anthropometric parameters that were not significantly different, since it has been established from various reports that anthropometric parameters, viz; age, sex, height, weight and ethnicity are factors that account for variations in FVC, FEV₁ and FEP (Cotes, 1975; Aderole and Oduwole, 1983; Jaja and Fagbenro, 1995; Njoku and Anah, 2004). There was a significantly lower mean lung function values obtained from the test group compared with the control group.

The lung function values in the control and test group with similar anthropometric indices showed that there was significant reduction in the values of the lung function parameters (FVC, FEV₁, FEV, FEP) quarry workers compared to the control group. This may account for the high prevalence of respiratory symptoms reported in this study among the quarry workers (test group), indicating that the lung function of the respondents had been impaired. Although the mechanism by which

dust particles reduce lung function is obscure, it may be that inhaled dust particles are lodged in the lung causing irritation and inflammatory reactions. It has been found that healing of this inflammatory process would cause fibrosis leading to defective oxygen diffusion and impaired pulmonary function (Kasper et al, 2008 and Nwibo et al, 2012).

The significant decline in the mean values of FEV₁, FVC and FEP and the negative correlation between duration of work and the lung function parameters showed that the longer the respondents were exposed at work, the lower the values (Table 3). These results are in agreement with previous studies which have attributed decreased FEV₁ and FVC to loss of lung function (Fatusi and Erbabor, 1996, Lemele et al, 1994, Bahrami, 2003, Nwibo et al, 2012).

Reduction in lung function parameters has been reported in cotton workers, flour mill, coal and tannery workers, workers exposed to tobacco dust, barley dust and in quarry workers (Garshick et al, 1996, Sultan and Abdulmajeed, 2005, Subodh et al, 2008, Halim et al, 2007, Nwibo et al, 2012).

Data from the present study suggest that chronic exposure to dust from crushing of rocks may increase susceptibility to respiratory problems and impaired lung function, with increased length of service as a predisposing risk factor. Safety measure should be encouraged in quarry sites.

REFERENCE

- Aderole W.L. and Oduwole O. (1983) Peak expiratory flow rate in healthy school children *Nig. J. Paed.* 10:45-55.
- Nwibo, AN, Ugwuja, EL, Nwambeke, No and Emelema, OF (2012). Pulmonary problems among Quarry workers of stone crushing industrial site at Umuohara, Ebonyi State, Nigeria. *Int.J Occupation Environ. Med.* 3(4): 178 -185
- Bahrami AR, Mahjub H. Comparative study of lung function in Iranian factory workers exposed to silica dust. *Eastern Mediterranean J* 2003;9:390-8.
- Cote, J. (1975). Lung Function Assessment and application. Oxford. Blackwell Scientific Publication 3-5.

Lung Function and Symptoms

- Fatusi A and Erbabor G. (1996) Occupational health status of Saw mill workers in Nigeria *J Roy Soc Health* 116: 232 – 6.
- Garshick E, Schenker MB, Dosman JA. Occupationally induced airway obstruction. *Med Clin North Am* 1996; 80:851-78
- Halim Issever, Kursat Ozdill, Bedia Ayhan, Bilge Hapcioglu, Nurhan Ince, Haluk Ince, Erol Isik, Erdem Akcayi, Yildiz Yegenoglu, Mustafa Erelel, Berrin Calak and Nihal Agbas (2007). *Respiratory Problems in Tannery Workers in Istanbul*. SAGE Publications
http://libe.sagepub.com.
- Jaja, S.I. and Fagbenro, A.O. (1995). Peak expiratory flow rate in Nigerian school children *Afr. J. Med. Sci.* 24: 379-384.
- Kasper DL, Braunwald. E and Fauci A.S. (2008) Environments, lung disease, in: Harrison's principles of internal medicine, 16th ed. New York: McGraw – Hill, 19: 41-47.
- Last, J.M. (1998). *Public Health and Human Ecology* (2nd Edition) McGraw-Hill Medical Publishing Prentice-Hall Int. Edition Canada. Pp153-200
- Lemele A, Araujo AJ, Lapa E (1994) Respiratory Symptoms and Spirometric Tests of quarry workers in Rio de Janeiro. *Rev Assoc Med Bras*; 40:23-35.
- Njoku C.H. and Anah, C.O. (2004) Reference values for peak expiratory flow rate in adults of African descent. *Tropical Doctor*. 34: 135-140.
- Olusegun O, Adeniyi A and Adeola GT (2009) Impact of Granite Quarrying on the Health of workers and nearby residents in Abeokuta Ogun State, Nigeria. *Ethiopian Journal of Environmental Studies and Management*. 2 (1):1-11
- Osim, E.E. and Esin, R.A. (1996). Lung function studies in some Nigerian Bank workers. *Centre Afr. J. Med.* 42:43
- Oxman AD, Muir DCF and Shannon HS (1993) Occupational dust exposure and chronic obstructive pulmonary disease. A systematic review. *A M Rev. Respir Dis*; 148: 38-48
- Park K. (2007) Occupational health In: Park's text book of preventive and social medicine 18th ed. Jabalpur: M/S Banarsidas Bhanot,; 608 – 10
- Subodh KR, Amit P and Sachin T (2008) Occupational health risks among the workers employed in leather tanneries at Kanpur. *Indian J Occup Environ Med* 12(3):132-135
- Sultan A and Abdulmajeed A (2005) Lung Function Among Non Smoking Wheat Flour Mill Workers. *Intern J Occup Med Envir Health* 18(3):259-264
- Tsin TW, Okelly FJ and Chan SL (1987) Survey of respiratory health of silica exposed gemstone Workers in Hong Kong. *Am Rev Respir Dis* 135; 1249
- Urom S.E, Antai AB and Osin EE (2004). Symptoms and lung function values in Nigerian men and women exposed to dust generated from crushing of granite rocks in Calabar, Nigeria. *Nigerian Journal of Physiological Sciences*; 19:41-7.