

The effects of working environment on lung functions and capacities in office workers and market traders in Southwest Nigeria

***Osonuga Ifabunmi Oduyemi¹, Olalekan Samuel Oluwadare¹, Osonuga Oyinlolaoluwa Oluwadolapo², Olukade Baliqis Adejoke¹, Okebule Babatunde Olufemi¹, Ogunlade Albert Abiodun¹,**

¹Department of Physiology, Faculty of Basic Medical Sciences, Olabisi Onabanjo University, Sagamu Campus, Sagamu, Ogun State, Nigeria.

²Department of Pharmacology, Faculty of Basic Medical Sciences, Olabisi Onabanjo University, Sagamu Campus, Sagamu, Ogun State, Nigeria.

***Corresponding Author:** Osonuga Ifabunmi Oduyemi
osonuga.bunmi@oouagoiwoye.edu.ng, +234 8034840747

Abstract

The aim of this study is to determine if significant differences exist in the lung functions and capacities of market traders in comparison to workers in standard offices. Forty people were randomly selected from Sagamu, Ogun state, Nigeria. Twenty traders from Sagamu market and 20 office workers from Olabisi Onabanjo University Teaching Hospital, Sagamu, Ogun state, Nigeria were recruited for the study. Questionnaires were distributed randomly to the individuals from Sagamu, Ogun state, Nigeria concerning their health and family background to obtain information on lung volume and lung capacities. The pulmonary function tests; forced vital capacity (FVC), forced expiratory volume (FEV), peak expiratory rate flow (PEFR), peripheral oxygen saturation (SpO₂), heart rate (HR) was examined using a spirometer. The height and weight were also measured. The result showed that there was no significant difference in the age, weight and height ($p=0.543$, 0.07 and 0.979 respectively) between the office worker and market trader groups. Also, there was a non-significant market trader groups. There was however a significant reduction ($p < 0.05$) in the FVC between the office workers (0.97 ± 0.71) and market traders (1.40 ± 0.55) and in FEV% between office workers (96.10 ± 4.96) and market traders (91.60 ± 6.10). Hence, we concluded that the working environment does have an influence on lung functions and capacities due to the effects of some factors like environmental factors that make market traders more prone to infections and allergies than office workers.

Keywords: Working environment, market traders, office workers, lung functions and capacities

Les effets de l'environnement de travail sur les fonctions pulmonaires et les capacités chez les employés de Bureau et les commerçants dans le Sud-Ouest du Nigeria

Resume

Le but de cette étude est de déterminer s'il existe des différences significatives dans les fonctions pulmonaires et les capacités des commerçants du marché par rapport aux travailleurs des bureaux standards. Quarante personnes ont été sélectionnées au hasard à Sagamu, dans l'État d'Ogun, au Nigéria. Vingt commerçants du marché de Sagamu et 20 employés de bureau de l'hôpital universitaire d'Olabisi Onabanjo, Sagamu, État d'Ogun, Nigéria ont été recrutés pour l'étude. Des questionnaires ont été distribués au hasard aux individus de Sagamu, dans l'État d'Ogun, au Nigéria concernant leur santé et leurs antécédents familiaux afin d'obtenir des informations sur le volume pulmonaire et les capacités pulmonaires. Les tests de la fonction pulmonaire ; la capacité vitale forcée (FVC), le volume expiratoire forcé (FEV), le débit expiratoire de pointe (PEFR), la saturation périphérique en

oxygène (SpO₂), la fréquence cardiaque (HR) ont été examinés à l'aide d'un spiromètre. La taille et le poids ont également été mesurés. Le résultat a montré qu'il n'y avait pas de différence significative d'âge, de poids et de taille ($p = 0,543, 0,07$ et $0,979$ respectivement) entre les groupes des employés de bureau et des commerçants du marché. De plus, il y avait une différence non significative ($p > 0,05$) dans les valeurs du VEMS, du DEP et de la SpO₂ entre les groupes des employés de bureau et des commerçants du marché. Il y avait cependant une réduction significative ($p < 0,05$) de la CVF entre les employés de bureau ($0,97 \pm 0,71$) et les commerçants du marché ($1,40 \pm 0,55$) et du VEMS% entre les employés de bureau ($96,10 \pm 4,96$) et les commerçants du marché ($91,60 \pm 6,10$). Par conséquent, nous avons conclu que l'environnement de travail a une influence sur les fonctions et les capacités pulmonaires en raison des effets de certains facteurs tels que les facteurs environnementaux qui rendent les commerçants du marché plus sujets aux infections et aux allergies que les employés de bureau.

Mots-Clés : Environnement de travail, commerçants, employés de bureau, fonctions et capacités pulmonaires

الهدف من هذه الدراسة هو تحديد ما إذا كانت هناك اختلافات كبيرة في وظائف الرئة وقدرات تجار السوق مقارنة بالعاملين في المكاتب القياسية، تم اختيار أربعين شخصاً بشكل عشوائي من شغامو ولاية أوغن وعشرين تجار من سوق شغامو وعشرين عمال من مكاتب مستشفى التدريس الجامعي لجامعة أولابيسي أونونجو شغامو ولاية أوغن نيجيريا تم تجنيدهم لهذه الدراسة، تم توزيع الاستبيانات بشكل عشوائي على الأفراد من شغامو ولاية أوغن نيجيريا بشأن صحتهم وخلفيتهم الأسرية للحصول على معلومات عن حجم الرئة وقدراتها وتم اختبارات الوظيفة الرئوية بما يلي: السعة الحيوية القسرية، حجم الزفير القسري، ذروة تدفق معدل التنفس، محيط تشبع الأكسجين، وتم فحص معدل ضربات القلب باستخدام مقياس التنفس كما تم قياس الطول والوزن. أظهرت النتيجة أنه لم يكن هناك فرق كبير في العمر والوزن والطول ($p = 0.543, 0.07$ and 0.979) بالترتيب بين العاملين في المكاتب ومجموعات تجار السوق. أيضاً، كان هناك فرق غير كبير بينهما ($p > 0.05$) في FEV₁, PEFR و SpO₂ بين العاملين في المكاتب ومجموعات تجار السوق. ومع ذلك، كان هناك انخفاض كبير ($p < 0.05$) في FVC بين موظفي المكاتب (96.10 ± 4.96) والتجار في السوق (91.60 ± 6.10). وبالتالي، خلصنا إلى أن بيئة العمل لها تأثير على وظائف الرئة، والقدرات بسبب آثار بعض العوامل مثل العوامل البيئية التي تجعل تجار السوق أكثر عرضة للعدوى والحساسية من العاملين في المكاتب.

Introduction

The respiratory system is a biological system consisting of specific organs and structures used for the process of respiration in an organism. In vertebrates, excluding fish, the respiratory system is involved in the intake of oxygen from the air breathed in and the release of carbon dioxide from the blood which is breathed out (Maton *et al.*, 2010). This process of gas exchange takes place in the alveoli of the lungs. In humans and other mammals, the anatomical features of the respiratory system include the trachea, bronchi, bronchioles, lungs, and diaphragm. Molecules of the gases - oxygen and carbon dioxide are passively exchanged, by diffusion, across the alveolar walls (Maton *et al.*, 2010).

The lungs process air making them the only internal organ that is constantly exposed to the external environment. Central to the human respiratory system, they breathe in between 2100 and 2400 gallons (8000 and 9000L) of air each day, that is, the amount needed to pump blood throughout the heart daily. The average human respiratory rate is 30-60 breaths per minute at birth (Scott, 2004) decreasing to 10-20 breaths per minute in adult. Air in the lungs is measured by lung volumes and lung capacities (Wilburta *et al.*, 2009). Individuals spend most of their active lives in their workplace environment and sufficient attention should be given to environmental situations at work. In Nigeria, the environmental situations of small and medium

scale entrepreneurs are quite unsatisfactory as a result of poor ventilation, absence or improper use of personal protective equipment, and inadequate awareness of health hazards in the workplace, more so, those in the processing, packaging and sale of substances that are respiratory sensitizers such as those comprising chemicals and dusts. However, this risk plays a role in the respiratory health of market men and women. An active lifestyle involving packaging, transport and sale of products and services may be beneficial to their health unlike the relatively sedentary lifestyle of office workers. The overall aim of this study is to determine if differences exist in the lung functions and capacities of market traders in comparison to workers in standard offices.

Materials And Methods

Study Sites

This study was conducted in Sagamu, Ogun State. Sagamu has a latitude of 6.8322° N and a longitude 3.6319° E.

Materials

The following materials were used in the experiment:

Meter rule, weighing scale, Spirometer, Pulse oximeter, Automatic Sphygmomanometer, Cotton wool, Methylated spirit

Questionnaire And Data Collection

Forty (40) people were randomly selected from Sagamu, Ogun state, Nigeria. Twenty (20) traders from Sagamu market and twenty (20) office workers from Olabisi Onabanjo University Teaching Hospital, Sagamu, Ogun state, Nigeria.

Methodology

Questionnaires were distributed randomly to the individuals from Sagamu, Ogun state, Nigeria concerning their health and family

background to obtain information on lung volume and lung capacities. The pulmonary function status was examined by measuring the following parameters such as forced vital (FVC), forced expiratory volume (FEV), peak expiratory rate flow (PEFR), peripheral oxygen saturation (SpO₂). The questions set include information on sex and age. The height, weight were also measured.

Procedures

The following parameters were determined.

Weight (Kg): was determined with a weighing scale with each subject in the standing position barefoot on the scale.

Height (m): was determined with a meter rule, the subject standing and backing the rule.

Lung capacity and volume (%) were measured with a portable spirometer. The subjects were asked to breathe into a mouthpiece attached to the spirometer in one second and this automatically displays the forced vital capacity, forced expiratory volume and peak expiratory flow rate on the screen of the portable spirometer. Peripheral capillary oxygen saturation (SpO₂): measured with a pulse oximeter. The pulse oximeter was fixed on the middle finger of each subject and it automatically read and displays the oxygen saturation rate and the pulse rate.

Ethical Considerations

The ethical committee of the Department of Physiology, Olabisi Onabanjo University, Sagamu Campus, Sagamu, approved the study.

Statistical Analysis

All results were expressed as Mean \pm S.D for each group. All group data were statistically evaluated using SPSS 15.0 software. Analysis of variance methods include the independent

Table 1: Demographic characteristics of the Study Population

Parameters		Mean \pm SD	Sig. (2 Tailed)
Age (Years)	OFFICE WORKERS(20)	45.60 \pm 5.32	0.543
	MARKET TRADERS(20)	43.40 \pm 5.32	
Weight (Kg)	OFFICE WORKERS(20)	66.95 \pm 10.68	0.07
	MARKET TRADERS(20)	74.75 \pm 15.33	
Height (m)	OFFICE WORKERS(20)	1.49 \pm 0.07	0.979
	MARKET TRADERS(20)	1.50 \pm 0.14	

*p < 0.05 is significant

samples Duncan comparison and T- test.
Statistical significant was set at $p \leq 0.05$.

Results

The result in Table 1 shows that there is no significant difference in the age, weight and height ($p=0.543$, 0.07 and 0.979 respectively) between the office worker and market trader groups, hence we conclude that there is no significant difference between the two group in terms of age, weight and height. The result in Table 2 showed that there was no significant difference ($p > 0.05$) in the FEV1, PEFR and SpO₂ values between the office worker and market trader groups. There was however a significant reduction ($p < 0.05$) in the FVC between the office workers (0.97 ± 0.71) and market traders (1.40 ± 0.55), $p < 0.05$. Lang *et al.* (2013) found out that obesity was associated with significantly reduced lung function in males while it was associated with improved lung function among females. Weights have effects on the lung functions

that can reduce respiratory well-being even in the absence of specific respiratory diseases (Salome, 2010) and this was in contrast to what was obtained in this research. In this study, there was a significant increase in the Forced Vital Capacity (FVC) when market traders were compared to office workers and Forced Expiratory Volume percentage (FEV %) decreased significantly when the market trader were compared with their office workers counterparts. Significant decrease in FVC may negatively impact lung flow rates and explains the marginal decrease, which implies a relative limitation in airflow of peripheral/distal airways and elastic recoil of the lungs in the office workers. Significant decrease indicates abnormalities in the large airways (Ibeneme, 2016). In the present study, it is possible that subsequent and consistent occupational exposure may be responsible for the lower FEV% of the market traders

Table 2: Effects of working environments on Lung Functions

Parameters		Mean \pm SD	Sig. (2 Tailed)
FVC	OFFICE WORKERS(20)	0.97 \pm 0.71	0.045*
	MARKET TRADERS(20)	1.40 \pm 0.55	
FEV1	OFFICE WORKERS(20)	0.85 \pm 0.95	0.068
	MARKET TRADERS(20)	1.20 \pm 0.40	
PEFR	OFFICE WORKERS(20)	2.10 \pm 1.50	0.710
	MARKET TRADERS(20)	1.91 \pm 0.91	
FEV%	OFFICE WORKERS(20)	96.10 \pm 4.96	0.015*
	MARKET TRADERS(20)	91.60 \pm 6.10	
SpO ₂	OFFICE WORKERS(20)	96.40 \pm 4.76	0.118
	MARKET TRADERS(20)	93.90 \pm 5.11	

*p < 0.05 is significant

However, physical activities may be attributed to the significantly higher value of FVC in market traders and non-significantly higher values for FEV1 and PEFR. It is plausible that proper ventilation might mitigate the adverse occupational exposure to inhaled allergens common with traders. Therefore, proper ventilation or lack of it would have played some important roles in the respiratory health of the market women. The relationship between housing and respiratory health has not been fully elucidated but some studies suggest an association between damp or moldy indoor environments and respiratory difficulties (Tischer *et al.*, 2011; Frankel *et al.*, 2012). Phakthong *et al.* (2007) also reported that exposure to cotton dust contaminants has been implicated in the etiology of several occupational respiratory

diseases. Frankel *et al.* (2012) reported that a higher ventilation rate may result to reduced exposure to inflammatory microbial constituents detected in a granulocyte assay. Therefore, it is possible that poor ventilation of buildings (houses/shops/warehouses), which has been reported in Nigeria (Jibril *et al.*, 2013; Ahianba *et al.*, 2008) would have adversely contributed to the respiratory symptoms observed among market traders.

Conclusion

Conclusively, there is a slight difference in the lung volumes and capacities between the market traders and office workers. And from the results of the study, it can be concluded that as a consequence of the influence of some environmental factors, market traders are more prone to infections

and allergies than office workers.

Conflict of Interest

There is no conflict of interest in this study.

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