

Respiratory symptoms and ventilatory function of the Bakery workers in Ibadan, Nigeria.

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Summary

A total of five hundred Bakery workers were studied to assess occupational induced lung impairment as a result of exposure to grain and flour dust. Occupational related symptoms were recorded using structured questionnaire. Age and sex matched controls consisting of 500 University College Hospital (UCH) Ibadan workers and students were used. They were apparently healthy and work and live at places free of fumes and smoke.

Peak expiratory flow rate (PEFR) was measured in all subjects. However, full spirometry work up was done on 100 bakery workers and 100 control subjects that had been selected using simple random sampling technique.

The most frequent pulmonary symptoms among the bakery workers were sneezing and running nose (53.30%) and periodic breathlessness/chest tightness (23.16%) while the symptom of cough/phlegm present in (21.53%) of the subjects.

The mean PEFR of the bakery workers (463.20 ± 51.39 L/min) was significantly lower ($P < 0.0001$) than that of the control subjects (538.0 ± 47.23 L/min). Similarly, the mean values of FEV₁, FVC and FEV₁% were also significantly lower than the control subjects.

The findings indicate that respiratory symptoms are common during the working hours among the bakery workers and 23.16% of the subjects studied suffered some degree of airway obstruction.

Keywords: Bakery workers, Respiratory Symptoms, Ventilatory function.

Résumé

Un nombre total de cinq cent boulangers ont été étudiés afin de déterminer l'affaiblissement du poumon provoqué par une profession à la suite de l'exposition au grain et à la farine. Des symptômes ayant rapport à la profession ont été notés en utilisant questionnaires structurés. Age et sexe étaient bien assortis par rapport aux témoins qui consistent en 500 personnels et étudiants du Collège Hospitalier Universitaire d'Ibadan ont été utilisés. Ils étaient tous apparemment en bonne santé et ils travaillent et habitent dans les ambiances de défense de fumer et sans pollution atmosphérique.

Taux d'expiration de flot maximal (Peak expiration flow rate) (PEFR) a été mesuré chez tous les sujets d'expérience. Toutefois, on avait fait un travail complet de spiromètre chez 100 boulangers et 100 sujets de témoin qui ont été choisis tout en utilisant la technique d'échantillonnage simple au hasard.

Les symptômes pulmonaires les plus fréquents chez les boulangers étaient éternuement, nez qui coule 53,30% et l'assoufflement/l'oppression de la poitrine périodique 23,16% tandis que les symptômes de toux/flegme notés chez 21,53% des sujets.

Le moyen PEFR des boulangers ($463,20 \pm 51,39$ L/min) était sensiblement en baisse ($P < 0,000,1$) plus que chez les sujets de témoin ($538,0 \pm 47,23$ L/min). Pareillement, les valeurs moyennes de FEV₁, FVC et FEV₁% étaient également sensiblement en baisse plus que chez les sujet de témoin.

A travers les résultats on arrive à la conclusion que les symptômes respiratoires sont plus fréquents pendant l'heure de travail chez les boulangers et 23,16% des sujets étudiés sont atteints de

l'obstruction de bronches dans une certaine mesure.

Introduction

In recent years the number of commercial Bakeries in Nigeria has increased tremendously and so also the number of workers employed in the industry. The workers are exposed to grain dust and heat during baking^{1,2} for example, obstructive and restrictive airway diseases have been reported in grain handlers and Bakery workers in other parts of the world³⁻⁵. This has led to vigorous preventive measures being taken in these industries.

In Nigeria, there is a dearth of studies on the symptoms and ventilatory functions of the Bakery workers. Jinadu et al⁶ reported cases of shortness of breath, sneezing and coughing among the bakery workers.

Similar observation was made by Backlate et al⁷ in Canada that cough, phlegm production, wheezing and dyspnea are acute symptoms of exposure to flour dust.

Jinadu et al⁶ documented that the mean values of FEV₁ and FVC decreased significantly in the Bakery workers during a work shift and suggested that the main problem of these workers was probably obstruction of the airways due to bronchoconstriction as a reaction to the flour dust. The bronchoconstriction is believed to be an IgE mediated response to the flour dust in the airways⁸.

This study was therefore aimed at determining the type and pattern of respiratory symptoms among the Bakery workers in Ibadan, determining the pattern of pulmonary function, making recommendation towards prevention of effect of flour dust on the Bakery workers and advising the health authorities about plans that could be made to safe-guard the health of such workers in this industry.

Methodology

Eighty Bakeries were visited. Five hundred non smoking male Bakery workers were selected for the study. Ex-smokers were excluded. The control consisted of five hundred University College Hospital (U.C.H.) office workers, doctors, medical student, students of medical records, physiotherapy and occupational therapy who had no respiratory symptoms and are none smokers.

The structured questionnaire, a modified form of questionnaire of respiratory symptoms approved by the British Medical Research was used to assess the symptoms of the Bakery workers.

At the Bakeries, the height and weight of each subject was taken without shoes and with light clothing. Measurement of the peak expiratory flow rate (PEFR) was performed with the subject sitting and fully relaxed using a Mini-Wright Peak Flow Meter (Clement Clarke International Ltd. London, UK). The highest measurement of three attempts was recorded. The same procedure was carried out on the control subjects.

Using simple random sampling technique, spirometry was done on 100 Bakery workers and 100 age matched control subjects with the aid of vitalograph PFTII in the Respiratory Laboratory Department of Medicine, University College Hospital, Ibadan. The table of numbers was used for the sampling which comprise of a series of randomly generated numbers. All the subjects were given number serially during the administration of the questionnaires. Selection on the table was started at the top left side. The numbers listed were then read off consecutively going from left to right of the table horizontally. Those subjects whose numbers fall within the listed random numbers were selected from spirometry.

With each of the subjects sitting comfortably and after initial familiarisation with the machine, the spirometry was conducted. The vitalograph PFTII (Vitalograph Ltd.) is adapted to yield computer calculated volumes. Dust concentration was not measured because of lack of instrument.

Statistical analysis

The means of the results of the ventilatory evaluation of the Bakery workers were compared with that of the control subjects using student 't' test on IBM (International Business Machine) computer using EPI - INFO version 5. P value less than 0.05 is considered significant.

Ethical approval

This study was approved by the Joint Ethical committee of the University College Hospital/University of Ibadan, Nigeria.

Results

The 500 Bakery workers recruited were male aged between 15 years and 60 years.

Table 1 shows the age distribution and summary statistics of the anthropometric measurements of the Bakery workers and the control subjects. Majority (219) of the workers belonged to the 25-34 years of age group accounting for (43.8%) followed by the 35-44 years age group accounting for 174(34.8%). Among the control subjects, 220 (44%) belonged to the age 25-34 years age group followed by 171 (34.2%) in the 35-44 years group.

The mean age and the standard deviation (S.D) of the Bakery workers were 33.67 ± 8.37 while that of the control was 33.50 ± 8.38 (P-value=0.75). The mean weight and standard deviation of the subjects and control workers were 64.70 ± 0.05 and 64.65 ± 0.08 respectively (p = 0.24). The mean height \pm S.D of the Bakery workers and the controls ($1.67 + 0.75$ Vs 1.67 ± 0.70) are also of no statistical significance (P=0.99).

Table 1 Age distribution and summary statistics of antropometric measurement of Bakery workers and control subjects

Antropometric parameters	Bakery workers	Control subjects
<i>Age group (years)</i>		
15-24	66 (13.2)*	68 (13.6)
25-35	219 (43.8)	220 (44)
35-44	174 (34.2)	171 (34.20)
45-54	30 (6.0)	31 (6.2)
≥ 55	11 (2.2)	10 (2.0)

* Number in parenthesis percentage

Table 4 Summary statistics of PEFR, FEV₁, FVC and FEV₁/FVC% by age groups among Bakery workers and control subjects.

Parameter	Age groups				
	15 - 24	25 - 34	35 - 44	45 - 54	>55
PEFR (L/min)					
Bakery workers	474.0 \pm 62.5*	480.6 \pm 67.2	442.9 \pm 53.0	423.2 \pm 59.6	366.9 \pm 62.8
Control Subject	580.2 \pm 65.7	547.8 \pm 65.7	541.8 \pm 69.1	430.0 \pm 51.3	433.2 \pm 31.21
P-value	0.0001	0.002	0.00001	0.0001	0.04
FEV₁ (L/Sec)					
Bakery workers	2.4 \pm 0.8	2.0 \pm 0.9	1.8 \pm 0.6	2.0 \pm 0.5	1.8 \pm 0.4
Control Subject	3.2 \pm 0.9	3.2 \pm 0.5	2.6 \pm 0.8	2.5 \pm 0.5	2.3 \pm 0.3
P-value	0.005	0.03	0.001	0.003	0.0001
FVC (Litres)					
Bakery workers	3.3 \pm 0.8	3.0 \pm 0.8	2.0 \pm 0.5	2.0 \pm 0.5	2.3 \pm 0.5
Control Subject	4.0 \pm 0.9	3.8 \pm 0.6	3.5 \pm 0.8	3.5 \pm 0.8	2.9 \pm 0.04
P-value	0.01	0.001	0.01	0.01	0.03
FEV₁/FVC%					
Bakery workers	70.3 \pm 8.6	70.3 \pm 4.3	69.3 \pm 6.9	71.5 \pm 7.1	70.0 \pm 7.4
Control Subject	78.1 \pm 5.9	79.6 \pm 4.4	74.9 \pm 5.9	78.1 \pm 5.4	77.3 \pm 5.2
P-value	0.001	0.04	0.009	0.002	0.001

* Each age group had 20 subjects *Mean \pm S. D.

Table 2 shows that the symptoms most commonly recorded were sneezing and running nose 375(53.30%) followed by periodic breathlessness/chest tightness in 157(23.16%) subjects. The other was cough with phlegm 146(21.52%) during the working hours.

Table 2 Respiratory symposium in Ibadan Bakery workers

Symptoms	No of responses	Percentages (%)
	N = 678*	
Sneezing and Running Nose	375	53.30
Periodic breathlessness/chest tightness	157	23.16
Coughing/Phlegm	146	21.53

* Multiple responses.

Pulmonary function test

Table 3 illustrates lung function tests of Ibadan bakery workers and controls. The FEV₁ (L/sec.) and the standard deviation of the bakery workers compared with the controls was $3.10 + 0.70$ Vs $3.50 + 0.70$ (P<0.0001) while that of FVC (L) was $3.69 + 0.80$ Vs $4.50 + 0.80$ (P<0.00001). The difference in the FEV₁% between the bakery workers and the controls was also of statistical significance.

Table 4 shows that the mean values of the peak expiratory flow rate (PEFR), forced Expiratory Volume in one second (FEV₁). Forced vital capacity (FVC) and FEV₁% were significantly lower among the bakery workers than the controls.

Table 3 Results of the lung function test of Ibadan Bakery workers and control

Variables	Bakery workers (100)	Control subjects (100)	P-Values
FEV ₁ (L/Sec)	3.10 + 0.7*	3.5 + 0.70	0.0001
FVC (Liters)	3.69 + 0.80	4.50 + 0.80	0.00001
FEV ₁ /FVC%	70.3 + 7.4	78.1 + 7.0	0.001
FEV ₁ %			

* Means + Standard deviation.

Discussion

This study has demonstrated that Ibadan Bakery workers have diverse respiratory symptoms due to constant inhalation of flour dust at the Bakeries. Sneezing and running nose were the most common symptoms which agrees with the earlier observation by Backlake et al⁷ that frequent sneezing and running nose were the most common symptoms among the Bakery workers when investigation was made about respiratory health problems in this industry. Other workers made similar observation^{9,10}.

Although non of the Bakery workers was diagnosed as suffering from asthma, periodic breathlessness/chest tightness was

documented in (23.16%) of the bakery workers. This does not contradict the findings in earlier studies^{9,10}.

The pulmonary function tests conducted among the bakery workers in this study showed statistically significant reduced mean values for PEF_r, FVC, FEV₁, FEV₁% when compared with the control subjects. These findings are similar to those of other workers⁶⁻¹². Jamison et al⁹ documented a greater than 25% decline in PEF_r and FEV₁ over a work shift in the Bakery.

Ashon et al¹⁰ documented some degree of reversibility in the lung function among the Bakery workers. FEV₁ and FVC which were normal at the start of a day's work progressively diminished towards the end of the working day and returned again to normal on leaving. In this study the mean FVC, FEV₁, and FEV₁% was significantly lower than those of the controls. When the findings of impaired lung function tests and the observation of the respiratory symptoms (sneezing, running nose, periodic breathlessness, chest tightness, cough/phlegm) were viewed against the background of the workplace, the possibility of environmental pollution was therefore considered responsible.

The findings in this study show clearly the need for protective devices in this industry. There is the need to wear dust masks, which will appear to provide a partial solution to the problem of constant inhalation of the flour dust. Local exhaust ventilation systems should be installed to reduce the volume of dust escaping into the working environment. A system of regular health assessment of the Bakeries must be established for their enforcement of the safety measures. Finally, education of the workers and the employers is crucial for the success of occupational health programmes.

The findings in this study mostly acute respiratory problems. Therefore, more detailed study needs to be conducted to identify the chronic respiratory problems, the effect of duration of exposure and cigarette smoking on the pattern of pulmonary function among the Bakery workers in Nigeria.

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