Charcoal-roasted plantain and fish vendors in Port Harcourt: A potential anaesthetic high risk group?

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To the Editor:

Summary
A survey of charcoal-roasted plantain and fish (CRPF) vendors in Port Harcourt, Nigeria was carried out to determine if they were a potential anaesthetic high risk group. Questionnaires which contained vendor's biodata and educational qualification including information on hours of exposure as well as number of years in the business and respiratory symptoms if present were filled by the authors in the presence of the vendors. Oxygen saturation and heart rate were recorded using the Nonnin 9250 portable battery-operated oximeter. Results were programmed into Microsoft EXCEL work sheet and data analysed.

A total of 102 vendors were visited at their place of work over a three month period. Two declined to be interviewed leaving 100 vendors. All vendors were women aged 16 to 60 years (mean 34.3 years). More than half of the vendors (52%) had secondary level education. Seventeen per cent were part-time vendors while 83% were full-time. Number of years of exposure ranged from 1 to 30 years (Mean 6.4 years). The daily duration of exposure ranged from 4 to 14 hours (mean 7.7 hours). Mean oxygen saturation was 97%, while mean pulse rate was 85bpm. There were no significant respiratory symptoms.

We conclude from this survey that outdoor cooking or roasting with charcoal less than 14 hours daily for less than 10 years may not be enough to cause respiratory problems or pose any significant anaesthetic risk.

Introduction
Charcoal grilling produces the highest level of polycyclic aromatic hydrocarbons (PAH). This is a large group of organic chemicals containing two or more fused aromatic rings made of carbon and hydrogen atoms. It is a known respiratory toxicant and has been associated with respiratory symptoms, bronchial anthracosis, as well as chronic obstructive pulmonary diseases (COPD). Periodic exacerbation of COPD is common; moreover, it induces a progressive deterioration in pulmonary function with marked increase in morbidity and mortality over time. Very high levels of PAH may also cause damage to red blood cells, liver and kidneys. In the relative health hazard spectrum of 0-3, PAH registers 1.3 while the relative hazard to the environment is 1.5. The risk ranking of PAH out of 208 substances is eighteen.

Women in developing countries who use wood and charcoal daily for cooking may be at a high health risk from inhaling the smoke emitted as well as developing pulmonary problems. A co-existing pulmonary disease further increases the risk of developing pulmonary complications perioperatively, and a low arterial oxygen tension preoperatively may be an indicator of a potential post-operative pulmonary complication. Charcoal-roasted plantain (bo le) and fish is a delicacy in Port Harcourt, Nigeria and the food vendors are mainly women seen at street corners or at strategic junctions within the city. The aim of this survey was to assess respiratory symptoms and oxygen saturation among these roasted plantain and fish vendors to determine if they may be at risk of respiratory complications if anaesthesia is required.

Method
A questionnaire survey was conducted among roasted plantain and fish vendors in Port Harcourt over a three month period. The questionnaires contained the vendors’ biodata and educational qualification and included information on number of years in the business, whether working part-time or full-time, as well as hours of exposure per day. Respiratory symptoms if any were documented and oxygen saturation and heart rate recorded using the Nonnin 9250 portable battery-operated pulse oximeter.

The vendors were approached by convenient sampling and interviewed at their place of work. One of the authors asked the questions on the questionnaire, while a volunteer anaesthetist registrar documented the answers in the presence of the vendors, thus converting the questionnaire section of the survey into a recording schedule. Results were programmed into Microsoft EXCEL worksheet and the data analysed.

Results
A total of 102 vendors were visited at their location. Two vendors after being interviewed asked not to be included in the survey and were dropped, leaving 100 vendors. Eighty-three (83) women
were full-time vendors while 17 worked part-time. All vendors were women between 16 to 60 years (mean 34.3 years). Amongst the full time vendors, 7 (8.4%) were in the 16 – 25 year group, 39 (47.0%) in 26 – 35 year group, 35 (42.2%) in the 36 – 45 year group, and 1 (1.2%) each in the 46 – 55 year and 56 – 65 year groups. The part time vendors were 9 (52.9%) in the 16 – 25 year group, 6 (35.3%) in the 26 – 35 year group and 2 (11.8%) in the 36 – 45 year group but none (0%) in the 46 – 55 and 56 – 65 year groups (Table I).

The oxygen saturations recorded were within normal range with a mean oxygen saturation of 97%, while mean pulse rate was 85 beats per minute. There were no significant clinical respiratory symptoms documented

Table I: Age distribution of CRPF vendors in Port Harcourt

| Age range (years) | Full-time (N = 83) N (%) | Part-time (N = 19) N (%) |
|-------------------|-------------------------|-------------------------|
| 16 -25            | 7 (8.4)                 | 9 (52.9)                |
| 26 – 35           | 39 (47.0)               | 6 (35.3)                |
| 36 -45            | 35 (42.2)               | 2 (11.5)                |
| 46 – 55           | 1 (1.2)                 | -                       |
| 56 -65            | 1 (1.2)                 | -                       |

Four per cent (4%) had no formal education (Table II). Number of years of exposure ranged from one (1) to thirty (30) years (mean 6.4 years). The number of full time vendors exposed for 0 – 5 years were 44 (53.0%), 6 – 10 years 30 (36.1%) and 11 – 15 years 7 (8.4%) while 1 (1.2%) vendor each was exposed for 16 – 20 years and 26 – 30 years respectively. No full time vendor was exposed for the 21 – 25 year. Amongst the part time vendors, 14 (82.4%) were exposed for 0 – 5 years, 2 (11.8%) 6 – 10 years and 1 (5.9%) 11 – 15 years. No part time worker was exposed for over 16 years (Table III).

Table II: Level of education of CRPF vendors in Port Harcourt

| Level of Education          | Number (%) |
|-----------------------------|------------|
| No formal education         | 4 (4%)     |
| Primary education           | 40 (40)    |
| Secondary education         | 52 (52)    |
| Post-secondary education    | 4 (4%)     |
| Total                       | 100 (100%) |

The daily duration of exposure was 4 to 14 hours (mean 7.7 hours). Amongst the full time vendors, the majority 50 (60.2%) were exposed for 8 – 11 hours per day. No full time vendor was exposed for less than 3 hours per day. Amongst the part time vendors, the majority 11 (64.7%) were exposed for 4 – 7 hours per day (Table IV).

The oxygen saturations recorded were within normal range with a mean oxygen saturation of 97%, while mean pulse rate was 85 beats per minute. There were no significant clinical respiratory symptoms documented

Table III: Number of years of exposure of CRPF vendors to charcoal smoke

| No of years | Full-time (N = 83) N (%) | Part-time (N = 17) N (%) |
|-------------|-------------------------|-------------------------|
| 0 – 5       | 44 (53.0)               | 14 (82.4)               |
| 6 – 10      | 30 (36.1)               | 2 (11.8)                |
| 11 – 15     | 7 (8.4)                 | 1 (5.9)                 |
| 16 - 20     | 1 (1.2)                 | -                       |
| 21 – 25     | -                       | -                       |
| 26 – 30     | 1 (1.2)                 | -                       |
| >30         | -                       | -                       |

Table IV: Number of hours of exposure of CRPF vendors per day

| No of hours | Full-time N = 83 N (%) | Part-time N = 17 N (%) |
|-------------|------------------------|------------------------|
| 1 – 3       | -                      | 3 (17.6)               |
| 4 – 7       | 27 (32.5)              | 11 (64.7)              |
| 8 – 11      | 50 (60.2)              | 2 (11.8)               |
| 12 - 15     | 6 (7.2)                | 1 (5.9)                |

Discussion
The burning of natural and biological materials such as wood and charcoal which have been in use since ancient times for cooking were thought to be friendly and harmless. This assumption no longer holds as it has been established, in recent times, that health-damaging pollutants and carcinogenic compounds including polycyclic aromatic hydrocarbons (PAH) are emitted when these materials are burned. Burning of wood is the oldest source for cooking and heating, especially in less developed countries and among the poor; women are particularly affected as they burn wood daily for cooking. The effects of exposure to PAH, produced from the burning of charcoal depends on the dose, duration, how the vendor is exposed, personal traits, habits and whether other chemicals are present. Roasting also generates PAH in foods being cooked.

Charcoal used by the vendors in this survey is a better choice for outdoor cooking because it causes less cough symptoms than wood. Wood and vegetative combustion materials are known to emit smoke with a variety of respiratory irritants and noxious agents. Wood smoke pollutants cause respiratory problems, especially for people with co-existing respiratory diseases and can cause respiratory symptoms even at relatively low levels. Cardiac problems have also been associated with wood smoke. Working outdoors in the open air helped to dilute the pollutants released thereby reducing the effective dose. The
The duration of exposure to pollutants of the vendors surveyed was not enough to cause respiratory problems. Most of the vendors were young women with a mean age of 34.6 years and there was a marked decline in number of women vendors after 10 years of charcoal smoke exposure. Clinical progression of respiratory problems is a function of both the duration and intensity of exposure to pollutants and biomass-smoke-related pulmonary disease may develop several years after high level exposure. This is, however, unlikely in these women vendors because of relatively early retirement from the business.

As this was a recording schedule, the women were approached on location and writing skills were not necessary. However, the educational level of street food vendors has been shown to vary from place to place. The illiteracy rate of charcoal roasted plantain and fish vendors in Port Harcourt was low. Only 4% had no formal education while 58% progressed beyond the recommended level of PAHs in air.

There is an association between length of exposure to wood smoke and the development of COPD. However, a daily exposure to charcoal smoke of 4 to 14 hours (mean 7.7 hours) for a mean period of 6.4 years did not pose any significant occupational hazard to these vendors. This is because outdoor cooking with charcoal minimises the risk of re-breathing of pollutants that are associated with cooking in confined spaces and ventilation is essential toward reducing the magnitude of pollutants that are associated with cooking in confined spaces. The educational level of street food vendors has been shown to vary from place to place. The illiteracy rate of charcoal vendors in Port Harcourt was low. Only 4% had no formal education while 58% progressed beyond the recommended level of PAHs in air.

In conclusion, the number of women vendors in Port Harcourt exposed to the occupational hazard of charcoal smoke declines with age. Outdoor cooking or roasting less than 14 hours daily for approximately 10 years is not enough to cause respiratory problems or pose any significant anaesthetic risk when anaesthesia is required. Further studies are required, therefore, caution must be exercised in the anaesthetic management of this group of patients and pre-operative oxygen saturation as well as spirometric studies may be necessary prior to administering anaesthesia.

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