

## OCCUPATIONAL HEALTH HAZARDS OF NIGERIAN FISHERMEN ASSOCIATED WITH CHRONIC INDOOR POLLUTION

E. J. Peters\*, R. A. Esin and A. K. Amah

*Department of Medicine, University of Calabar Teaching Hospital, Calabar, Nigeria*

### ABSTRACT

Investigation into the various occupational hazards and other problems was carried out among 520 Nigerian fishermen who were chronically exposed to indoor pollution from local fish drying methods.

The 520 Nigerian fishermen were randomly selected from 3 fishing settlements in the riverine areas of Nigeria. The fishermen were 236 males and 284 females, aged between 20 - 45 years who have been in the occupation for a minimum of 5 years. The results were compared with a control group of aged and sex-matched 400 Nigerians from the same area that were not in similar occupation and were not exposed to any known pollutant. They were all non-smokers. It was found from the study that there was increased prevalence of respiratory symptoms and other related symptoms among the fishermen than the control population ( $p < 0.001$ ). The mean value of peak expiratory flow rate (PEFR) was also found to be lower among the fishermen than control group ( $p < 0.001$ ). The study also revealed marked overcrowding with poor ventilation within the drying huts which also serve as dwelling places for the fishermen.

Follow up studies will be required to determine the long-term effects of this chronic indoor pollution on various systems of the body, particularly the respiratory.

### INTRODUCTION

Fishermen in the riverine areas of Nigeria preserve their marine products by drying them using local fish drying methods. These involve a lot of exposure of the products to naked fire from firewoods, thus drying them gradually. These procedures produce a lot of smoke and volatile components from fish, causing significant indoor pollution. Furthermore, these fishermen are often exposed to this environment over considerable long period of time.

In Nigeria as in many developing countries, all the precautionary measures against occupational health hazards for exposed workers are hardly taken. This may be due to the high cost of buying and maintaining the protective equipment for exposed workers.

Significant indoor pollution has been reported by Azizi *et al.* [1] to cause respiratory impairment and other related diseases. Similarly, earlier study has shown impaired lung functions indices among Nigerian fishermen exposed to smoke [2]. There are also reports on lung function impairment attributed to exposure to smoke from domestic cooking and hut fire [3].

This study, therefore, is designed to provide perspective on ways to assess diseases for which environmental and occupational causes are suspected. This assessment is important because removal of the patient from a harmful environment is often the only intervention that might prevent further significant deterioration and lead to improvement in a patient's condition. Furthermore, the identification of an

environmentally associated disease in a single patient may lead to primary preventive strategies in other similarly exposed people who have not yet developed the disease.

Finally, the fishermen themselves would be informed about the nature of potential health hazards in the drying process and would eventually be encouraged to adopt practices that would reduce health risk.

### SUBJECT AND METHODS

Five hundred and twenty Nigerian fishermen randomly selected from three fishing settlements located in the coastal towns of Nigeria were used for this study. They were aged between 20 - 45 years and must have been in the occupation for a minimum duration of 5 years. The fishermen used for the study were those using similar local methods of drying fish. These methods consisted of large mud stands with firewoods and charcoal which serve as a source of fire and smoke. The drying nets/wire were placed about 1 meter above the mud stand and the marine products placed on top of the net. These methods resulted in significant indoor pollution from smoke and volatile substances. The fishermen were interviewed and examined individually. A thorough general and systemic examination was carried out in all the fishermen used for the study. The various systemic symptoms elicited from each fisherman were documented in a protocol sheet prepared for each person. Mini wright peak flow meter was used to

\*Author for correspondence

assess the pulmonary functions.

Physical (anthropometric) parameters like weight, height without shoes and blood pressure were measured. The same weighing scale, height scale and sphygmomanometer were used for all subjects under the study and measurements were done by the same person (EJP). Since the study design involved travelling to remote villages with lack of facilities, it was not technically possible to measure spirometric lung functions, blood gases and concentration of smoke.

### Questionnaire

The pattern of occupational health hazards was further facilitated by the use of questionnaire for each subject. A modified British Medical Council respiratory disease questionnaire was personally administered to all subjects [4]. The questionnaire elicited information on respiratory symptoms, medical history, occupational history, and smoking history.

The accommodation problem faced by the fishermen was further evaluated by determining the number of occupants per room which served as both dwelling places and drying areas thus ensuring continuous exposure of the fishermen to smoke.

### Control population

The control population consisted of 400 healthy Nigerian males and females. They were aged and sex-matched with the study group and were drawn from the same area and were not exposed to any known air pollutant and were non-smokers.

The same procedures above were repeated for the 400 control subjects after careful explanation of the test procedure and familiarization with equipment used. As sex is an important factor that affects ventilatory functions [5], the ventilatory data obtained were tabulated for males and females, so as to allow proper comparison. Similarly, anthropometric data of test subjects and controls were also tabulated for males and females.

### Data analysis

The master sheets of data were eventually compiled before analysis. Results were expressed as means and standard deviation (SD) as well as percentages. The Student's *t*-test was used to compare means. The information obtained from both the protocol sheet and questionnaire was used in determining the occupational health hazards of the fishermen.

## RESULTS

A total of 520 fishermen consisting of 236 males

and 284 females and a control population of 400 non-exposed persons consisting of 192 males and 208 females were evaluated. The general characteristics of the study group and control population is as in Table I, while Table II shows age and sex distribution of the study group. The prevalence of respiratory symptoms and other related symptoms between the study group and control group was compared in Table III. Generally, there was increased respiratory symptoms among the exposed fishermen than control group, and these were found to be statistically significant ( $p < 0.001$ ). There was also high prevalence of other related symptoms like eye irritation (41.6%), skin irritation (25.0%), internal heat (12.3%) and weight loss (30.0%) in the study group than in the control group. The anthropometric parameters and peak expiratory flow rate between exposed fishermen and control group are compared in Table IV. The ventilatory status of the fishermen under study is shown in Table V. About 19.2% of the fishermen shared a room with 6 - 10 persons while 14.6% shared a room with more than 10 persons, thus suggesting overcrowding with poor ventilation. Only 23% of the fishermen shared a room with one or two persons.

Fig. 1 is the histogram showing the relationship between PEFR and duration of exposure to smoke. There was a gradual and progressive reduction in PEFR with longer years of exposure to smoke.

## DISCUSSION

This study has amply demonstrated that Nigerian fishermen are exposed to many occupational health hazards associated with chronic indoor pollution from local fish drying methods. Most of these health hazards results from chronic inhalation of sooths from volatile substances and smoke. These results are similar to findings obtained in other studies from individuals exposed to the same contaminated environment and irritants [6, 7].

The ventilatory function (PEFR) of the fishermen were significantly lower than the control group ( $p < 0.001$ ). Similarly reduced ventilatory function indices have also been reported by other investigators who studied persons exposed to smoke from fire fighting or firewood stoves [8, 9]. The decreased PEFR observed among fishermen corresponded with prolonged duration of exposure to smoke as seen in Fig. 1.

There was also an increase in the proportion of respiratory and non-respiratory symptoms in the study group when compared with the control group. Rothman *et al.* [10] had reported increased prevalence of these symptoms among fire fighters in United States of America. Similar increases in the prevalence of

respiratory symptoms have been reported by other workers in exposed people of same working environment [11, 12].

The higher prevalence rate of other related symptoms such as weight loss and internal heat are in agreement with findings by other workers [6, 13]. This suggests that severe indoor pollution from exposure to smoke and fumes in the drying process may increase the prevalence of these symptoms. The fact that the

fishermen do not use any protective device such as face masks or protective clothings may have also contributed to the increased prevalence of these symptoms. These increases in symptoms is in agreement with findings by other investigators who have established casual relationship between exposure to dusty occupation/irritant and respiratory morbidity [14, 15].

**Table I.** Characteristics of subjects and controls (Mean ± SD)

Parameters	Subjects n = 520	Males n = 236	Females n = 284	Controls n = 400	Males n = 192	Females n = 208
Mean height (m)	1.58 ± 0.08	1.60 ± 0.11	1.57 ± 0.10	1.62 ± 0.09	1.63 ± 0.12	1.59 ± 0.11
Mean weight (kg)	59.2 ± 3.06	62.16 ± 4.5	55.14 ± 3.98	59.63 ± 3.44	62.84 ± 5.2	56.20 ± 4.5
Mean age (years)	34.06 ± 1.7	35.24 ± 2.6	33.14 ± 2.3	35.27 ± 2.03	35.84 ± 3.0	33.6 ± 2.61
Mean PEF <sub>R</sub> (l)	318.8 ± 16.4	335.16 ± 21.8	298.00 ± 21.5	586.89 ± 33.8	592.00 ± 49.1	418.00 ± 33.9
Mean duration of exposure (years)	9.84 ± 0.56	9.35 ± 0.45	10.24 ± 0.80	-	-	-

**Table II.** Age and sex distribution of fishermen

Age group (years)	n = 520	Percentage (%)	Males (n = 236/%)	Females (n = 284/%)
20 - 24	70	13.7	30 (13.1)	40 (14.0)
25 - 29	100	19.3	39 (16.5)	62 (21.8)
30 - 34	106	20.8	46 (19.6)	62 (21.8)
35 - 39	82	16.0	36 (14.7)	48 (17.1)
40 - 45	162	31.6	85 (36.0)	72 (25.0)

**Table III.** Comparison of respiratory symptoms between fishermen and controls

Respiratory symptom	Fishermen (n = 520/%)	Control (n = 400/%)	P. value
Unproductive cough	67 (12.8)	46 (11.6)	<0.001
Cough and sputum	261 (50.4)	35 (8.2)	<0.001
Dyspnoea	91 (17.6)	16 (4.0)	<0.001
Wheezing	50 (9.6)	7 (1.7)	<0.001
Chest pain	125 (24.0)	49 (12.3)	<0.001
Catarrh and sneezing	91 (17.6)	24 (6.0)	<0.001

**Table III.** (Continued)*Other symptoms*

Other symptom	Fishermen (n = 520/%)	Control (n = 400/%)	P. value
Skin irritation	145 (28.0)	17 (4.3)	<0.001
Weight loss	102 (19.7)	29 (7.3)	<0.001
Eye irritation	216 (41.6)	10 (2.6)	<0.001
Headache	66 (12.0)	18 (4.6)	<0.001
Internal heat	99 (19.2)	12 (3.0)	<0.001

**Table IV.** Comparison of anthropometric parameters and peak expiratory flow rate (PEFR) between fishermen and controls

Parameters and ventilatory indices	Subjects (n = 520 ± SD)	Controls (n = 400 ± SD)	t' values	Level of significance
Weight (kg)	59.2 ± 3.06	59.63 ± 3.44	0.093	NS
Height (m)	1.58 ± 0.08	1.62 ± 0.01	0.496	NS
Age (years)	34.06 ± 1.76	33.27 ± 2.04	0.449	NS
PEFR (l)	318.8 ± 16.4	587.89 ± 53.8	7.131	p<0.001

NS = Not significant

**Table V.** Ventilatory status of fishermen under study

No. of persons per room	n = 520	Percentage (%)
1 - 2	119	23.0
3 - 5	225	43.2
6 - 10	99	19.2
>10	77	14.6

From the result of this study, it was noted that there was significant overcrowding among the fishermen in their dwelling room/drying huts. Although the role played by overcrowding among these fishermen is not certain, it would appear that it might have negatively influenced the ventilation due to the stuffy environment. Ninety-nine fishermen (19.2%) shared a room with between 6 - 10 persons while 77 fishermen (14.6%) shared a room with more

than 10 persons. This situation leads to poor ventilation especially at the peak moment of fish drying process. These may also explain the high prevalence rate of respiratory symptoms in this study. Overcrowding and indoor pollution are well recognized causes of respiratory morbidity [16]. Similarly, indoor pollution and poor ventilation have been implicated as responsible for increased respiratory symptoms and other related symptoms in

a number of studies [17, 18].

Thus, apart from the exposure of the fishermen to smoke, overcrowding of dwelling places and significant indoor pollution also contributed greatly to occupational health hazards of these fishermen. This is coupled with the fact that the fishermen do not use any protective devices such as face masks, protective clothings and hand gloves. It may, therefore, be concluded that chronic indoor pollution associated

with local fish drying methods resulted in various health problems of the fishermen, particularly respiratory impairment.

Finally, the health and economic loss from fires resulting from fish drying in fishing settlements where dwellings are often constructed of highly inflammable materials, may add to the burden of health hazards and respiratory impairment.

## HISTOGRAM SHOWING RELATIONSHIP BETWEEN PEFR AND DURATION OF EXPOSURE

FIG. 1

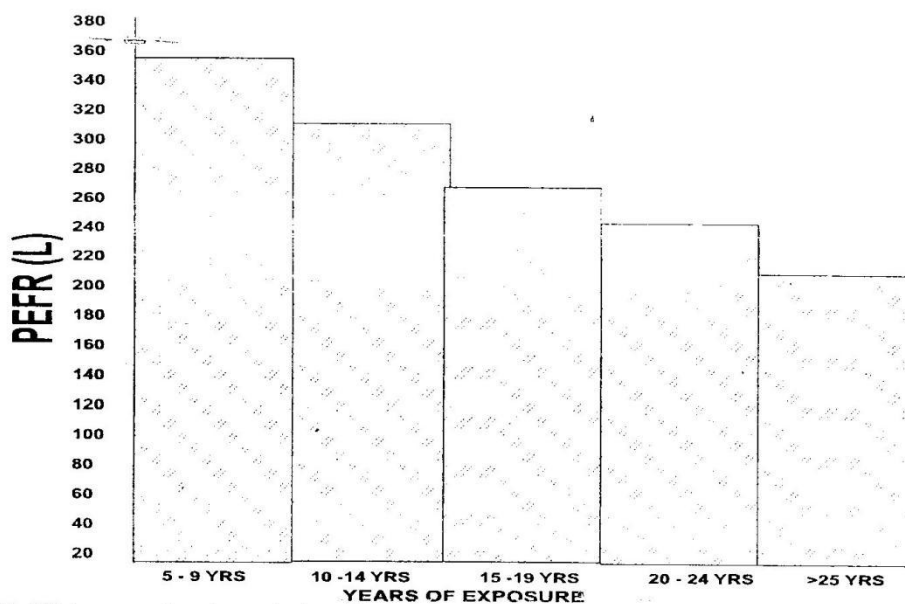


Fig. I. Histogram showing relationship between PEFR and duration of exposure

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