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HEALTH AND THE ENVIRONMENT — A COMPARATIVE STUDY OF AGRICULTURAL AND INDUSTRIAL WORKERS IN NIGERIA

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Summary

Although several attempts have been made in the developed countries to study the effect of various environmental factors on morbidity, it is disappointing that in developing countries where very poor conditions exist, very little information is available on the subject. This study was therefore designed to examine the influence of the living and working environment on the state of health of two groups of Nigerian workers namely farmers and industrial workers.

The study was carried out in two villages Badeku and Ewekoro. 200 farmers from Badeku and 150 industrial workers from Ewekoro were selected by appropriate sampling methods. Most of the data were obtained by means of a questionnaire administered by the authors. In addition to a detailed clinical examination of each subject, blood stool and urine specimens were obtained for laboratory investigations.

A high incidence of hookworm and ascaris infection, anaemia, leg ulcer, malaria parasitaemia and onchodermatitis was found among the farmers. The industrial workers on the other hand had a higher incidence of chronic bronchitis and hypertension. Some of these findings have been attributed to poor environmental hygiene of the homes and work places, atmospheric pollution and other health hazards associated with living and working in the rural areas.

Résumé

Bien qu'on ait essayé à plusieurs reprises, dans

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les pays développés, d'étudier l'influence des facteurs variés de l'environnement sur la morbidité, il est décevant de noter que dans les pays en voie de développement, où les conditions sont très mauvaises, il n'y a que très peu d'information sur le sujet. Ce travail a été destiné, par conséquent, à l'étude de l'influence de l'environnement du lieu d'habitation et du lieu de travail sur l'état de santé de deux groupes de travailleurs nigériens, à savoir les paysans et les ouvriers qui travaillent dans l'industrie.

L'étude a été effectuée dans deux villages: Badeku et Ewekoro. 200 paysans de Badeku et 150 ouvriers industriels d'Ewekoro ont été sélectionnés par des méthodes d'échantillonnage appropriées. La plupart des données ont été obtenus par le moyen d'un questionnaire administré par les auteurs. En plus d'un examen clinique détaillé de chacun des sujets, des prélèvements de sang ainsi que des échantillons de selle et d'urine ont été obtenus pour examen au laboratoire d'anémie, d'ulcère de la jambe, et de paludisme parasitaemia et onchodermatite a été observée chez les paysans. En revanche, les ouvriers industriels accusaient une incidence plus élevée de bronchite chronique et d'hypertension. Nombre de ces conditions ont été imputées à la mauvaise hygiène de l'environnement des habitations et des lieux de travail, à la pollution, et à d'autres conditions qui constituent des risques à la santé et qui sont associés au fait d'habiter et de travailler dans les zones rurales.

Introduction

One of the greatest health problems facing the developing world today and which unfortunately

* Oyo and Ogun States are two of the 19 States in Nigeria which are close to each other geographically.

has received very little attention is the influence of the various environmental factors on the health of the individual. Although several attempts have been made in the developed countries to study the effects of these environmental factors on morbidity, (WHO 1972; Martins, 1967; Holma & Winding, 1977) it is disappointing that in developing countries where very poor conditions exist, very little information is available on the subject. In Nigeria for instance, 84% of the people live and work in the rural areas, and 56% and 0.1% of the 18 million labour force in the country work on farms and industries respectively (United Nations, 1969), yet the effects on health of their living and working conditions have not been subject to much investigation.

The present study examines the influence of the living and working environment on the state of health of two groups of Nigerian workers, namely farmers and industrial workers.

Study areas

The study was carried out in two rural areas, Badeku and Ewekoro. The former is a small village situated about 27 km north of Ibadan the capital of Oyo State.* It has a population of 2394 and the main occupation of its inhabitants is farming. The other study area was Ewekoro, a village with a population of 306 and situated about 50 km south of Abeokuta the capital of Ogun State.* It has located in it since 1960, a cement factory which has provided job opportunities for almost all the young adult male population in the area and from other neighbouring villages. The establishment of such an industry has paved the way for the construction of modern facilities like good housing, pipe-borne water, sanitary sewage disposal system and electricity. Unfortunately, these modern amenities are limited to only a few of the privileged workers who lived within the factory premises.

Materials and methods

For the purpose of this study, 200 farmers were randomly selected from the list of members of Badeku agricultural production and supply company, a feature of the integrated rural health project† which became operative in Badeku in 1973. Also, a 10% sample of the production workers in the cement factory were selected by

the stratified sampling method. In all 150 industrial workers were included in the survey. It was not possible to select farmers and industrial workers from the same local environment for the following reasons: (1) there were no factories in Badeku or any other rural areas of Oyo and Ogun States except in Ewekoro, and (2) a detailed examination of farmers could not be carried out in Ewekoro as there was no health centre or even a dispensary.

A questionnaire designed to elicit information concerning housing conditions, water supply and environmental sanitation was administered to each subject. In addition, the following investigations were carried out on each of them using standard techniques.

- General clinical examination including blood pressure measurements.
- Stool—macroscopic and microscopic examination for protozoa cysts and helminthic ova.
- Blood—blood films for malaria parasites and microfilaria and blood specimens for estimation of packed cell volume (PCV).
- Urine—microscopic examination for schistosomal eggs and microfilaria.

Results

It was not possible to interview and examine all the 200 selected farmers as many of them leave for their farms very early and return late. Consequently, the questionnaires could only be administered to 178 of the 200 farmers originally included in the survey. One-hundred-and-forty (70.0%) of the 200 farmers and 136(90.6%) of the 150 industrial workers presented themselves for the clinical examination and further investigations.

Table 1 gives the age distribution of the two groups. The ages of the farmers ranged from 21

TABLE 1. Age distribution of two groups of workers in two rural parts of Nigeria

Age	Farmers		Industrial workers	
	<i>n</i>	%	<i>n</i>	%
20-29	7	5.0	27	19.9
30-39	24	17.1	68	50.0
40-49	47	33.6	38	27.9
50-59	34	24.3	3	2.2
60-69	23	16.4	—	—
70+	5	3.6	—	—
Total	140	100	136	100

to 70 years and the industrial workers from 21 to 59 years. One-hundred-and-thirty-three (97.8%) of the industrial workers as compared with seventy-eight (55.7%) of the farmers were under 50 years of age.

Housing conditions

Table 2 summarizes the finding with regards to the housing conditions of the two groups of workers. All the farmers live in their own or a relation's house, whilst 144(96.0%) of the industrial workers live in rented accommodation in overcrowded conditions. In seventy-eight (52.0%) of the houses occupied by the industrial workers, the rooms were shared by at least five families. In ninety-one (51.1%) of the farmers' houses compared with twenty-six (17.3%) of the cement workers', cooking is done inside the houses in the adjoining passages to the bedrooms; the remaining eighty-seven (48.9%) of the farmers and one-hundred-and-twenty-four (82.7%) of the cement workers have separate

kitchens or cook in open spaces behind the house. All the farmers use firewood for cooking whilst 106(70.7%) of the cement workers use an oil stove mainly because they have a higher income than the farmers. On the question of sewage disposal, 160(89.9%) of the farmers compared with thirty (20.0%) of the cement workers defecate indiscriminately in the bush or in the open spaces behind their dwellings, eighteen farmers (10.1%) compared with 120(80.0%) of the cement workers use pit latrines. Finally, as shown in Table 2, all the farmers and 117(78.0%) of the cement workers obtain their drinking water from wells; twenty-three (15.3%) of the cement workers obtain their drinking water from streams whilst ten (6.7%) have pipe borne water delivered to them from the factory.

Clinical findings

The main clinical findings are shown in Table 3. Only four (2.9%) of the farmers compared with eleven (8.1%) of the industrial workers were obese. Eighty (57.0%) of the farmers had various skin lesions. Onchodermatitis with or without skin nodules was present in sixty (42.9%), skin infections, including eczema, warts and mycotic infections, were found in fourteen (10.0%), and six (4.3%) had chronic leg ulcers. Only five (3.7%) of the industrial workers had dermatitis. Various eye lesions were noted in eleven farmers aged between 45 and 60—conjunctivitis-ptyerigium complex in

TABLE 2. Housing condition of two groups of workers in Nigeria

Conditions	Farmers		Industrial workers	
	n	%	n	%
Ownership				
Own/relation's house	178	100	5	3.3
Employer's house	—	—	1	0.7
Rented house	—	—	144	96.0
No. of family unit in the house				
1	75	42.1	3	2.0
2-4	103	57.9	69	46.0
5+	—	—	78	52.0
Cooking facilities				
Kitchen/outside	87	48.9	124	82.7
Cooking in corridor/room inside the house	91	51.1	26	17.3
Method of cooking				
Firewood	178	100.0	44	29.3
Oilstove	—	—	106	70.7
Sewage disposal				
Bush-open spaces behind dwellings	160	89.9	30	20.0
Pit latrine	18	10.1	120	80.0
Water supply				
Pond/stream	—	—	23	15.3
Well	178	100.0	117	78.0
Pipe borne	—	—	10	6.7
Total	178	—	150	—

TABLE 3. Clinical findings among two groups of Nigerian workers

Clinical findings	Farmers		Industrial workers	
	n	%	n	%
Obese	4	2.9	11	8.1
Onchodermatitis	60	42.9	—	—
Cement dermatitis	—	—	5	3.7
Skin infection	14	10.0	—	—
Chronic leg ulcers	6	4.3	—	—
Pterygium-Conguntivitis Complex	6	4.3	—	—
Corneal opacity	3	2.1	—	—
Corneal ulcer	2	1.4	—	—
Lymph node enlargement	50	35.7	48	35.3
Gingivitis	56	40.0	29	21.3
Chronic Bronchitis	1	0.7	18	13.2
Inguinal hernia/scar of previous operation	21	15.0	16	11.8
Total	140	—	136	—

TABLE 4. Comparison of blood pressure readings between two groups of workers in rural parts of Nigeria

Age	Farmers			Industrial workers		
	No. examined	Mean systolic	Mean diastolic	No. examined	Mean systolic	Mean diastolic
20-29	7	121.4	69.3	27	127.9	78.2
30-39	24	122.1	72.2	68	133.3	84.1
40-49	47	128.5	77.0	38	141.9	84.6
50-59	34	138.9	81.6	3	141.8	87.5
60-69	23	139.2	84.3	—	—	—
70+	5	161.2	90.0	—	—	—
Total	140	—	—	136	—	—

six, corneal opacity in three and corneal ulcer in two. None of the industrial workers had any eye lesions. The incidence of lymph node enlargement was roughly the same in the two groups whereas the incidence of gingivitis among the farmers was double that of the industrial workers. Finally, eighteen (13.2%) of the industrial workers were found to be suffering from bronchitis, but only one (0.7%) of the farmers was so affected.

Table 4 shows the mean arterial pressure readings in the two groups. The blood pressure levels of the farmers were found to be consistently lower in all age groups than those of the industrial workers. A more detailed study of the individual arterial blood pressure shows that eighteen (12.9%) of the 140 farmers and sixteen (11.8%) of the 136 industrial workers had blood pressure readings of over 140/90 mmHg* respectively. Four (22.2%) of the former group compared with fifteen (93.8%) of the latter were under 50 years of age.

TABLE 5. Incidence of individual parasites among two groups of workers in rural areas of Nigeria

Parasite	Farmers		Industrial workers	
	n	%	n	%
Malaria	20	14.3	—	—
<i>Ova of</i>				
<i>S. haematobium</i>	1	0.7	—	—
<i>S. mansoni</i>	4	2.9	—	—
<i>S. hookworm</i>	116	82.9	13	9.6
<i>Ascaris lumbricoides</i>	100	71.4	68	50.0
<i>Trichuris trichuria</i>	53	37.9	7	5.2
<i>Enterobium vermicularis</i>	2	1.4	4	2.9
Larva of <i>Strongyloides</i>				
<i>stereoralis</i>	1	0.7	—	—
<i>Microfilaria volvulus</i>	1	0.7	—	—
<i>Microfilaria loa</i>	4	2.9	—	—

*According to the African standard, hypertension exists when blood pressure is over 140/90 mmHg.5.

Blood, stool and urine

The incidence of individual parasites in the blood, urine or stools of the subjects is shown in Table 5. Malaria parasites were found in twenty (14.3%) of the farmers who were at work and apparently well, whilst four (2.9%) had microfilariasis identified as loa-loa. No parasites were seen in the blood of any of the industrial workers.

Hookworm, ascaris and trichuris trichuria were the three most common helminthic infections present in the two groups. Among the farmers, the infection rates for hookworm, ascaris and trichuris were 82.9, 71.4 and 37.9% respectively; the corresponding infection rates among the industrial workers were 9.6, 5.0 and 5.2% respectively.

Table 6 shows the distribution of the packed cell volume (PCV) among the two groups of workers. According to the international standard, anaemia exists if the PCV is less than 42% for males. In this study, 103 (73.6%) of the farmers and twenty-nine (21.3%) of the industrial workers had PCV values of 42% or less.

TABLE 6. Distribution of the packed cell volume among two groups of workers in Nigeria

Work group	No. examined	PCV		
		0-34%	35-42%	Over 42%
Farmers	140	20(14.3)*	83(59.3)	37(26.4)
Industrial workers	136	—	29(21.3)	107(78.7)

* Percentage shown in parenthesis

Discussion

Although the farmers and industrial workers used in this study were not drawn from the same local environment, the findings have highlighted nevertheless the influence of the living and

working environment on the health of workers in the rural areas of Nigeria. The study revealed that more than half of the farmers are exposed to indoor smoke pollution and very poor standards of environmental hygiene at home and on the farm. On the other hand, a majority of the industrial workers live in overcrowded conditions but with slightly better standards of environmental hygiene. The latter is most probably a reflection of the influence of the work environment in teaching better standards of environmental hygiene. Bad residential environment and its adverse effect on the health of Nigerian children has been reported by previous researchers (Oduntan, 1971, 1975; Sofoluwe, 1968; Oyemade & Olugbile, 1977). Sofoluwe in his study showed that smoke pollution inside houses might be an important aetiological factor in acute bronchiolitis and bronchopeumonia among children treated in a Lagos hospital. However, indoor smoke pollution has never been incriminated as an aetiological factor of chronic bronchitis in adults. The fact that chronic bronchitis was more common among the cement workers than the farmers in this study suggests that exposure to air pollution in the work environment is an important aetiological factor. The role of occupational exposure to cement dust in the production of chronic bronchitis and emphysema among European workers has been well established (Kalacic Ivo, 1973; Vuskocil, 1962; Gardner *et al.*, 1939; Thompson, 1928) and our findings suggest a similar situation in Nigeria.

The study further revealed a high incidence of skin lesions especially onychodermatitis, various eye lesions, hookworm, ascaris and malaria infections among these rural communities especially the farmers. The different ecology in the two study areas and the age of the farmers cannot be the only explanation for these findings. Agricultural workers in Nigeria go about barefooted and are constantly exposed to physical hazards such as minor injuries, bites of mosquitoes and other vectors of diseases so that even in endemic areas a higher rate of infections like onchocerciasis and hookworm are common findings. The pterygium complex is most probably due to chronic irritation with dust whilst corneal ulcer and opacity may be attributed to minor eye injuries which had been left untreated.

It is noteworthy that none of the industrial workers had malaria parasitaemia, and only 21.3% of them (compared with 73.6% of the

farmers) were found to be anaemic. This observation is most likely due to the influence of the works clinic where anti malaria prophylaxis and immediate treatment of malaria and other infections is given to the industrial workers.

A high incidence of gingivitis was found among the farmers which is suggestive of vitamin C deficiency. This is not unexpected considering that most of the food crops grown on the farms are not consumed by the farmers but transported to the cities where they are sold to city dwellers who can offer them more money. The industrial workers are slightly better off in their nutritional intake since the factory canteen provides mid-day meals at a subsidised rate. The farmers therefore need health education about the nutritional values of food substances so that they would appreciate the need to increase the production of fruits and other crops for their personal consumption.

Finally, it has been shown that the mean arterial pressure in the farmers is lower in all age groups than that of the industrial workers. The blood pressure readings in the former group are similar to those reported from other rural areas of Nigeria (Akinkugbe & Ojo, 1968). On the other hand, the values obtained among the rural industrial workers are higher than those found in other rural population groups but very similar to those of an urban population in Nigeria (Johnson, 1971). Similar findings have been observed in post-war Poland (Zbigniew Orłowski, 1976). In the rural and relatively less developed parts of Poland only 4.5% of the male population were hypertensive whilst the corresponding figures for the developed agricultural areas and a medium sized industrial city were 7.3 and 15.1% respectively. Among numerous environmental factors which have been suggested to contribute to the rise of arterial pressure are stresses usually associated with increased urbanization and industrialization. In this study, the higher incidence of hypertension in the relatively younger cement workers can be related to the degree of industrialization as well as to the unfavourable working conditions which are characterized by noise, vibration and shift work (Olugbile, 1978).

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