



Hypertension in the Workplace: Study among Workers in an Oil Production Company in Pointe- Noire (Congo)

**Ebenguela Ebatetou Ataboho^{1,2*}, Patricia Atipo-Galloye³
and Donatien Moukassa²**

¹Occupational Medicine Department, Clinic Total E&P Congo, P. O. BOX 761, Pointe - Noire,
Congo-Brazzaville, Congo.

²Faculty of Health Sciences, Marien Ngouabi University, P. O. BOX 69, Brazzaville, Congo.

³Faculty of Medicine, Pharmacy and Ondontostomatology, Cheikh Anta Diop University, Dakar,
Senegal.

Authors' contributions

This work was carried out in collaboration among all authors. Author EAE designed the study, performed the statistical analysis, wrote the protocol, managed the literature searches and wrote the first draft of the manuscript. Author PAG managed the analyses of the study. Author DM reviewed and validated the research protocol and the final format of the submitted manuscript. All authors read and approved the final manuscript.

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ABSTRACT

Hypertension is a real public health problem in the world. The almost rare data on hypertension in the Congolese oil sector led us to carry out this study.

Objective: Describe the epidemiological profile of the hypertensive worker in a Congolese oil production company in the city of Pointe-Noire.

Methodology: This is an observational study, descriptive cross in collection of retrospective data, which involved 815 workers. After informed consent, a questionnaire was administered to workers whose variables such as weight, height, and blood pressure were taken. Statistical analysis was carried out using the EPI-INFO 7 software.

*Corresponding author: Email: ebatetou@gmail.com;

Results: The prevalence of hypertension in workers was 16.3%, i.e. 18.0% in men and 8.0% in women with a significant difference ($p < 0.05$). 25.8% of hypertensive workers were obese and 19.0% overweight. Obese workers were approximately 5 times more vulnerable than others to hypertension, and this was significantly ($p < 0.001$). Risk factors such as age, gender and BMI and diabetes have been significantly associated with hypertension. The older the worker, the more there was an increased risk of developing hypertension ($p < 0.001$). However, other factors such as sports activity and smoking were not significantly related to hypertension ($p > 0.05$).

Conclusion: Hypertension is a worrying pathology among workers in an oil company in Congo. It would be imperative to strengthen communication with employees with the aim of raising awareness and changing behavior.

Keywords: High blood pressure; workers; oil company.

1. INTRODUCTION

Any operation involving the production of oil necessarily exposes significant risks. The environmental study of oil production sites shows exposure to hydrocarbons, to noise pollution linked to flares, furnaces, turbines, pumps, compressors, etc. to anxiety and stress that can harm the health of workers and develop several pathologies such as than arterial hypertension [1].

It is estimated that around one billion people in the world suffer from hypertension and this figure is expected to increase further with the aging of the population [2]. Hypertension is unevenly distributed across continents and across countries (20% of the American population, 18% of the Chinese population and 15% of the French population) [3]. Cerebrovascular accidents (CVA) are among the most rapidly fatal complications of hypertension [4]. Hypertension is no longer a disease of the West because it also affects developing countries [5].

In the African region, 20 million people are believed to be affected [6]. In Africa, the prevalence of hypertension in the workplace varies from one country to another according to professional activity, which has been reported in several African series [7-12]. In the workplace, hypertension appears to be linked to work-related stress [13, 14]. Professional activity has a significant impact on the occurrence of hypertension, through its psychosocial components that are unfavorable for the worker.

The mortality rate in Congo was estimated at 11.5 per 1,000 in 2012. This mortality is mainly attributed to communicable diseases (malaria, tuberculosis and HIV infection) and noncommunicable diseases (NCDs), including hypertension with its main complication (stroke),

diabetes, cancer and sickle cell disease are also cited among the causes of death [15].

In Congo, although the prevalence of hypertension is not sufficiently documented (even less in Pointe-Noire), the Social, Technological and Environmental Pathways to Sustainability (STEPS) survey carried out in 2004 revealed a prevalence of 32.5% in the Congolese population, proving that this condition is a real public health problem [16]. The same study showed that diabetes (7%) and obesity (8.6%) also determined the risk factors for hypertension.

The spontaneous evolution of risk to cardiovascular complications, cerebrovascular see sudden death, increased in the environment where the worker is subjected to permanent stress productivity justified the realization of this study in order to describe the epidemiological profile of a hypertensive worker in a Congolese oil production company in the city of Pointe-Noire.

2. METHODOLOGY

The study took place in an oil exploitation and production company in the department of Pointe-Noire, which is the economic capital of Congo-Brazzaville. An observational, descriptive and cross-sectional study was carried out with prospective data collection from January to December 2019, i.e. a duration of 12 months.

The study population, recruited on an exhaustive sampling basis, consisted of all the personnel of the oil company. The workers were selected during the hiring and periodic medical visits organized during the year.

The data was collected using a structured questionnaire previously programmed on a tablet

with the Android application Kobo Collect version 1.14.0a, by consulting the records of medical visits.

The other data collection tools consisted of the scale, calibrated and verified to measure weight; and the height chart to measure height.

It should be noted that the body mass index (BMI) was calculated by the ratio of weight (in kilograms) to the square of the height (in meters).

The different data of the study collected from the questionnaires were first of all the independent variables, in particular the sociodemographic characteristics (age, sex), the anthropometric variables (weight, height, BMI), the biological variables (glycemia), the other variables (smoking, work rhythm, practice of sport) and secondarily the main dependent variable, in particular systolic and diastolic blood pressure.

The variables used in the study were defined as follows:

- According to WHO criteria, obesity has been distinguished four classes: thinness, normal weight, overweight and obesity.
- Hypertensive: any subject with systolic blood pressure (SBP) ≥ 140 mm Hg and / or diastolic blood pressure (DBP) ≥ 90 mm Hg or subject under treatment who has taken an antihypertensive drug regardless of his blood pressure (BP).
- Diabetic: any subject with fasting venous blood glucose ≥ 1.26 g/l or subject under antidiabetic treatment.
- Tobacco consumption: consists of occasional or regular smoking of tobacco or cigarettes, actively or passively.
- Physical activity for health: it was assessed by a duration of less than or greater than three (3) hours per week. Whatever the type of sport practiced, the sedentary or weakly active were the employees who had a regular cumulative physical activity of less than 3 hours / week; and the active and highly active, those who had a cumulative physical activity of more than 3 hours / week.
- Daytime or office work: this is work that is done from 7.15 a.m. to 12.15 p.m. and 3 p.m. to 6 p.m. from Monday to Friday.
- Shift work or work on site: It is work that is done at different times over a given period of days or weeks.

Data entry was made via smartphones with the Kobo Collect Android app version 1.14.0a and data processing was carried out on EPI-INFO7 and Stata 14 software.

The analyzes made on the study sample were univariate and bivariate to look for associations between two variables.

All analyzes were performed with an α error of 5% and a confidence interval set at 95%. The P-value corresponds to the probability that the observed association appears by chance. When the P value was less than 0.05, the association between two variables category was said to be statistically significant.

3. RESULTS

Table I summarizes all the sociodemographic parameters of our study population.

The average age of the workers was 40.3 ± 8.9 years with extremes of 26 and 65 years. Quartiles were represented by the first quartile Q1 (25%), the median Q2 (50%) and the third quartile Q3 (75%) with the respective ages of 33, 38 e t 45.

Diabetic status and the notion of occasional or regular tobacco use were investigated. Of the 815 employees in our study population, 10.8% (n = 88) were diabetics and 4.3% (n = 35) smokers.

The prevalence of hypertension as defined by the WHO in the study population was 16.3% (n = 133). Details on the different values systolics and diastolics blood pressure values are shown in Table II.

The distribution of workers according to socio-demographic characteristics and whether they are hypertensive is shown in Table III. Only 13.5% (n = 18) of hypertensive workers were of normal weight, the rest were either overweight or obese.

According to the status of diabetic or not and of tobacco consumption or not, the hypertensive and non-hypertensive workers were distributed as shown in Table IV. All the cases of diabetes found were type 2.

4. DISCUSSION

The population of this study was representative because our sampling was exhaustive including

all the employees of the first oil company of the country because of its size and its economic power. Thus, these results could be interpreted optimally and be extrapolated to other oil companies in Congo.

The prevalence of hypertension in current study was 16.3%. It is significantly lower than that found (32.5%) in a larger (n = 2095) and more heterogeneous sample from Brazzaville in 2044

during the STEPS survey [16]. This is most certainly justified by the fact that the survey only considered the employees of a given activity sector and not the other strata of the Congolese population, who also represent a large fraction of the population. In addition, comparable prevalences were also reported in a study carried out in the construction sector in Senegal (17%) [12].

Table I. Distribution of workers according to sociodemographic characteristics

| Characteristics | Effective | % |
|-----------------------|------------|------------|
| Age (years) | | |
| 20-29 | 52 | 6.4 |
| 30-39 | 408 | 50.1 |
| 40-49 | 227 | 27.9 |
| 50-59 | 85 | 10.4 |
| ≥ 60 | 43 | 5.3 |
| Sex | | |
| Female | 148 | 18.2 |
| Male | 667 | 81.8 |
| Work rhythm | | |
| Daytime | 536 | 65.8 |
| Shiftwork | 279 | 34.2 |
| Weight status | | |
| Thinness | 6 | 0.7 |
| Normal weight | 271 | 33.3 |
| Overweight | 352 | 43.2 |
| Obesity | 186 | 22.8 |
| Sport activity | | |
| < 3 hours/week | 736 | 90.3 |
| > 3 hours/week | 79 | 9.7 |
| Total | 815 | 100 |

Table II.I Distribution of workers by blood pressure

| Blood pressure | Effective | % |
|----------------------------|------------|------------|
| SBP (mm Hg) | | |
| < 120 (Optimal) | 230 | 28.2 |
| 120-129 (Normal) | 227 | 27.9 |
| 130-139 (Pre hypertension) | 225 | 27.6 |
| 140-159 (Stage 1) | 97 | 11.9 |
| 160-179 (Stage 2) | 26 | 3.2 |
| >180 (Stage 3) | 10 | 1.2 |
| DBP (mm hg) | | |
| < 80 (Optimal) | 495 | 60.7 |
| 80-84 (Normal) | 120 | 14.7 |
| 85-89 (Pre hypertension) | 90 | 11 |
| 90-99 (Stage 1) | 82 | 10.1 |
| 100-109 (Stage 2) | 18 | 2.2 |
| >110 (Stage 3) | 10 | 1.2 |
| Total | 815 | 100 |

SBP: systolic Blood Pressure, DBP: Diastolic Blood Pressure

Table III. Distribution of workers according to sociodemographic characteristics and hypertension status

| Characteristics | Hypertensive | | No Hypertensive | | P |
|--------------------------|--------------|-------------|-----------------|-------------|-------|
| | Effective | % | Effective | % | |
| Sex | | | | | |
| Female | 13 | 8.8 | 135 | 91.2 | 0.006 |
| Male | 120 | 18.0 | 547 | 82.0 | |
| Age (years) | | | | | |
| 20-29 | 1 | 1.9 | 51 | 98.1 | 0.029 |
| 30-39 | 48 | 11.8 | 360 | 88.2 | |
| 40-49 | 38 | 16.7 | 189 | 83.3 | |
| 50-59 | 31 | 36.5 | 54 | 63.5 | |
| ≥60 | 15 | 34.9 | 28 | 65.1 | |
| Work rhythm | | | | | |
| Daytime | 85 | 15.9 | 451 | 84.1 | 0.622 |
| Shiftwork | 48 | 17.2 | 231 | 82.8 | |
| Activité physique | | | | | |
| < 3 hours/week | 124 | 16.8 | 612 | 83.2 | 0.212 |
| >3 hours/week | 9 | 11.4 | 70 | 88.6 | |
| Weight status | | | | | |
| Thinness | 0 | 0 | 6 | 100 | 1 |
| Normal weight | 18 | 6.6 | 253 | 93.4 | |
| Overweight | 67 | 19.0 | 285 | 81.00 | |
| Obesity | 48 | 25.8 | 138 | 74.2 | |
| Total | 133 | 16.3 | 682 | 83.7 | |

Table IV. Distribution of workers according to certain risk factors and hypertension status

| Risk factors | Hypertensive | | No Hypertensive | | P |
|-----------------|--------------|-------------|-----------------|-------------|--------|
| | Effective | % | Effective | % | |
| Diabetes | | | | | |
| Yes | 28 | 31.8 | 60 | 68.2 | <0.001 |
| No | 105 | 14. | 622 | 85.6 | |
| Tobacco | | | | | |
| Yes | 9 | 25.7 | 26 | 74.3 | 0.124 |
| No | 124 | 15. | 656 | 84.1 | |
| Total | 133 | 16.3 | 682 | 83.7 | |

In general, studies carried out in an African workplace have found hypertension frequencies markedly higher than that found in our study: 29.7% at the Port of Abidjan [7]; 34.5% in a banking institution in Brazzaville [8], 49% among millers in Lubumbashi [10] and 43.7% in a telecommunications company in Dakar [11].

This study supported the hypothesis that the risk of developing high blood pressure increases with age. In fact, it was found that 1.9% hypertensive in workers under 30 years and 71.4% in those over 50 years. The results are corroborated by those in the literature which associate hypertension with the elderly black African [17-19].

Hypertensive men predominated over women, this could be explained either in relation to our industry which generally employs more men than women (sex ratio of 4.1) or either because the blood pressure figures are generally higher for men than for women. On the latter hypothesis, a study noted that the prevalence of hypertension is generally less common in women before menopause [20].

In this study, no link was found between high blood pressure and work rhythms. The prevalence of hypertension was quite similar among daytime employees (15.9%) than those on shift schedules, particularly in the context of on-site work (17.2%) although the scientific literature concedes that the reduction in Sleep time, such as that associated with shift and night

work, is associated with an increased risk of high blood pressure and cardiovascular, coronary and cerebral morbidity and mortality [21-23].

Tobacco is a risk factor found in 25.7% of hypertensive workers who smoke against 15.9% of non-smoking workers. The literature reports that tobacco has an influence on blood pressure [24-26] but in our study, tobacco is a risk factor whose influence was not demonstrated. This observation should be put into perspective because the study population is a low consumer of tobacco.

Hypertension is about twice as common in patients with diabetes than in the rest of the population, with rates in Africa ranging from 20 to 60% depending on the region [27]. The prevalence of hypertension has been of 31.8% in the population of workers with type 2 diabetes, while this prevalence is much higher in several other African studies where it is of the order of 65-81% [28].

The link between obesity and the risk of developing arterial hypertension no longer needs to be demonstrated. In this work, only 13.5% of the workers surveyed had a normal weight and 25.8% of the hypertensive workers were obese, although some authors found higher prevalence, 52% and 54.9% [29,30]. However, obesity remains a major problem in our population due to its magnitude. This situation could be explained by the fact that culturally obesity is a sign of ease or wealth in black Africa.

The results of this study show that sports activity is not related to the occurrence of hypertension. Workers participating in sports for less than three hours a week are exposed to hypertension in the same way as those who exercise more than three hours a week. These results do not reproduce the same conclusions as those of other studies [31, 32] which have found that physical inactivity is a major risk factor in the occurrence of hypertension.

5. CONCLUSION

High blood pressure is a major public health problem in Congo. This study has shown its magnitude in this oil production enterprise, confirming national and international scientific data. Preventive measures are needed to reduce or limit its impact on employees, on their work performance and on company production. This

will require the establishment of corporate communication targeting the main risk factors such as obesity, sedentary lifestyle, complications of arterial hypertension, etc. The reduction in its scope in the workplace will also require the realization of longitudinal studies to better understand the mechanisms of obesity occurrence.

CONSENT

As per international standard or university standard written participant consent has been collected and preserved by the author(s).

ETHICAL APPROVAL

It is not applicable.

COMPETING INTERESTS

Authors have declared that no competing interests exist.

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