

Hypertension and Work Stress among City Hall Workers, Bohicon, Benin

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Abstract

Introduction: In the general population as well as in the workplace, hypertension is one of the main causes of morbidity and mortality in the world. The particularities of hypertension in the world of work remain little studied. The objective of this study was to determine the prevalence and factors associated with hypertension among workers in a town hall in Benin in 2019. **Methods:** This was a descriptive, analytical cross-sectional study conducted from December 2018 to January 2019. A comprehensive recruitment was conducted. Data were collected during a face-to-face interview, supplemented by measurement of anthropometric parameters and blood pressure as well as a work stress assessment. Frequencies were compared using the chi-square test and Fisher's test. The significance level was 5%. **Results:** A total of 86 workers were included. Their mean age was 41.55 ± 9.82 years with a sex ratio of 6.1. The prevalence of hypertension was estimated to be 18.6% [95% CI: 11.96% - 29.75%]. Hypertension was higher in workers under work stress (41.18%) as opposed to non-stressed workers (14.49%) ($p = 0.032$); in those who were overweight (30.77%) as opposed to non-overweight (2.94%) ($p < 0.001$); and in those with a family history of hypertension (38.10%) as opposed to non-stressed (13.85%) ($p = 0.034$). **Conclusion:** Work stress and obesity are modifiable factors associated with hypertension in workers at the Bohicon city hall. These factors deserve to be corrected by occupational health promotion and prevention actions.

Keywords

Hypertension, Stress, Overweight, Workers, Benin

1. Introduction

Hypertension is a major contributor to the burden of disease from heart disease, stroke, and kidney failure and is the leading contributor to premature death worldwide, accounting for nearly 10 million deaths [1] [2]. It disproportionately affects populations in low- and middle-income countries where health systems are poorly developed [1] [2]. In sub-Saharan Africa, the prevalence of hypertension among adults varies between 15% and 30% according to the results of STEPS surveys and screening campaigns of the International Society of Hypertension [3] [4]. Many modifiable factors contribute to the high prevalence of hypertension: consumption of foods containing too much salt and fat, insufficient consumption of fruits and vegetables, overweight and obesity, harmful use of alcohol, sedentary lifestyle, stress, socioeconomic determinants, and difficulties in accessing health care [5] [6]. Occupational pathogens including sedentary at work, work stress, noise and chemical exposure can induce or aggravate hypertension [7] [8] [9]. Stress, and in this case work-related stress, is an important risk factor for the development of hypertension in the face of increasingly stressful working conditions and demands. According to the International Labour Organization recommendations, occupational health services, when they exist, are responsible for the implementation of policies for the prevention of non-communicable diseases in the workplace [10]. In Benin, the prevalence of hypertension in the general population was 25.2% in 2015 [11]. The prevalence of hypertension varies from one sector of activity to another. In the tertiary sector, the prevalence of hypertension was respectively 41.9% among employees of the Office de Gestion du Fret Multimodal (Congo Kinshasa); 32.52% among workers of the Ministry of Health (Benin, 2012); 25.3% among employees of a bank (Benin 2016) [12] [13] [14]. The town halls in Benin and in particular that of the commune of Bohicon do not have a health and work service to monitor their staff. The objective of the present study was to determine the prevalence and associated factors of hypertension among the workers of the Bohicon town hall.

2. Materials and Methods

2.1. Study Design

This was a descriptive and analytical cross-sectional study conducted from December 2018 to January 2019.

2.2. Framework of the Study

The study took place in the town hall of the commune of Bohicon in central Benin. The main activities are office activities requiring the use of computers and long hours in a sitting position.

2.3. Study Population and Sampling

The study population consisted of workers at the Bohicon town hall. They were workers over 18 years of age with at least 6 months of seniority. An exhaustive

recruitment was carried out.

2.4. Data Collection

Data collection was done by face-to-face interviews. Data were collected using a standardized form based on the World Health Organization (WHO) STEPS questionnaire for the surveillance of non-communicable disease risk factors and the Karasek questionnaire. Information provided included sociodemographic, occupational, behavioral, nutritional, and medical history characteristics. The standardized form was integrated with smartphones using the Kobo-Collect application for direct data entry.

Physical measurement instruments such as: mechanical adult scales (model 761, SECA), graduated mobile toises, graduated flexible metric tapes were used as a basis for collecting the data necessary for our study (weight, height, waist circumference). Blood pressure (BP) was measured with an electronic blood pressure monitor (SPENGLER brand) fitted with an adapted cuff. The BP was taken in a sitting position after a rest of at least 15 minutes. The measurement was taken on the bare left arm, placed on a table, palm up. The investigator placed the cuff above the elbow crease, aligning the “ART” symbol with the brachial artery, and secured it with the Velcro. Three consecutive measurements spaced 3 minutes apart were taken. Blood pressure was the average of the last two measurements.

2.5. Study Variables

1) Hypertension: Any subject with a systolic blood pressure (SBP) greater than or equal to 140 mmHg and/or a diastolic blood pressure (DBP) greater than or equal to 90 mmHg and any subject under antihypertensive treatment according to WHO criteria was considered hypertensive. The blood pressure considered is the average of 3 successive measurements.

2) Tobacco use: An active smoker was defined as any subject who had smoked cigarettes or any other substance in the past 12 months.

3) Alcohol consumption: subjects who had consumed alcoholic beverages during the last 30 days prior to the survey were considered to be alcohol consumers. The consumption was qualified as harmful according to gender. According to the WHO, it is the intake of 4 standard glasses per day for women and 6 standard glasses per day for men.

The standard drink is the international unit of alcohol. The net alcohol content of a standard glass is 10 g of ethanol. This is equivalent to a standard beer (285 ml), a small glass of liquor (30 ml), a medium-sized glass of wine (120 ml), or an aperitif (60 ml) [15].

4) Fruit and vegetable consumption (≥ 5 portions/day): information on fruit and vegetable consumption was obtained from self-reports following explanations provided to respondents in relation to self-quantification using fruit and/or vegetable portions; the portion corresponds to a mass of 80 g of fruit and/or vege-

tables [15]. The average daily consumption of fruit is determined by multiplying the number of portions of fruit consumed per day by the number of days consumed per week by 7. The average daily consumption of vegetables is determined by multiplying the number of portions of vegetables consumed per day by the number of days consumed per week by 7. Daily fruit and vegetable consumption is considered sufficient if one of the following 3 conditions is met: average daily fruit consumption ≥ 5 or average daily vegetable consumption ≥ 5 or average daily fruit and vegetable consumption ≥ 5 per day during the week.

5) Excessive salt consumption: workers who reported excessive salt consumption or those who often add salt to their meals while eating were considered to be excessive salt consumers.

6) Physical activity practice: it was informed by a series of questions provided by the WHO questionnaire. Three different environments were explored: physical activity at work (paid or unpaid; at home or outside); physical activity during leisure or sport; physical activity during travel. Physical activity is considered sufficient if one of the following three conditions is met: a) High-intensity physical activity for 75 minutes or more per week; b) Moderate-intensity physical activity for 150 minutes or more per week; c) An equivalent combination of moderate- and high intensity physical activity reaching at least 600 MET-minutes per week [16]. Metabolic equivalent (MET) expresses the ratio of metabolic rate during physical activity to metabolic rate at rest. One (1) MET is the energy expended by a person sitting still and is equivalent to a consumption of 1 kcal/kg/hour. For the analysis of the questionnaire data, the following principles from the Global Physical Activity Questionnaire were applied: the caloric expenditure of a moderately active person is estimated to be four times higher, and that of a very active person eight times higher, than the caloric expenditure of a person sitting still. To calculate a person's total energy expenditure from the questionnaire data, 4 METs are assigned to time spent in moderately intense physical activities and 8 METs to time spent in intense physical activities [16].

7) Overweight: was considered overweight any worker with a Body Mass Index (BMI) ≥ 25 kg/m² (a BMI greater than or equal to 25 kg/m² and less than 30 kg/m² was considered overweight and any subject who had a BMI greater than or equal to 30 kg/m² as obese)

8) Work stress: this was filled in using the Karasek questionnaire. This questionnaire is divided into three parts which determine three scores by calculation. These parts are: decision latitude, psychological demand and social support at work.

Responses from "strongly disagree" to "strongly agree" are transformed into a value from 1 to 4. The questions are numbered from K1 to K26. The calculation methods are:

Decision latitude score = $2 \times [K1 + (5 - K2) + K3 + K5 + K7 + K9] + 4 \times [K4 + (5 - K6) + K8]$; Psychological demand score = $K10 + K11 + K12 + (5 - K13) + K14 + K15 + K16 + K17 + K18$; Social support score = $K19 + K20 + K21 + K22 +$

K23 + K24 + K25 + K26. Decision latitude is low when the score is below 71, psychological demand is high when the score is above 21 and social support is low when the score is below 24 [17].

Job stress has been defined by the combination of low decision latitude, high psychological work demands and low social support from colleagues and hierarchy.

9) Shift work is any form of work organization in which workers are successively occupied at the same workstations according to a certain rhythm, either continuous or discontinuous, resulting in the need for them to perform work at different times over a given period of days or weeks. Shift work status is indicated by the job description provided by the employer.

10) Prolonged sitting: a subject was considered to be in a prolonged sitting position if he/she sat for more than 6 hours per day.

2.6. Data Analysis

Data analysis was performed with Epi-info 7.2.6 software. Proportions were calculated for qualitative variables and means with standard deviations for quantitative variables. Univariate analysis was performed to search for associations between hypertension and the independent variables. Prevalence ratios (PRs) and their 95% confidence intervals were calculated. PRs were not calculated for variables with extreme proportions (0% or 100%). Comparison of frequencies was done using Fisher's test when the theoretical numbers were less than 3, Yates' χ^2 when the theoretical numbers were between 3 and 5 and Pearson's χ^2 when the numbers were greater than 5. The significance level was set at 5%.

2.7. Ethical Considerations

Permission was obtained from city hall officials and informed consent was obtained from participants. The data were collected with respect to confidentiality and human rights. Data management and use were done anonymously.

3. Results

3.1. Socio-Demographic Characteristics

Of the 103 city hall workers, 86 met the inclusion criteria (86.4) and participated. The mean age of the workers was 41.55 ± 9.82 years; with extremes of 23 and 70 years. The sex ratio (male/female) was 6.1. Among the workers, 72 (83.72%) were living with a partner, 58 (67.44%) had at least a high school education. **Table 1** presents the distribution of socio-demographic characteristics of the workers.

3.2. Professional Characteristics

At the professional level, there were 67 (79.91%) workers in permanent positions; 5 (5.88) in shift work; 17 (19.77%) with a seniority of more than 10 years; 65

Table 1. Distribution of workers in the Bohicon town hall according to socio-demographic characteristics in 2019; (N = 86).

	Number	Proportion (%)
Age		
15 - 25	4	4.7
25 - 35	19	22.1
35 - 45	33	38.4
45 - 55	17	19.8
55 - 65	12	13.8
≥65	1	1.2
Gender		
Male	58	67.44
Female	28	32.56
Marital status		
Never married	10	11.62
Married	48	55.81
Separate	2	2.33
Widow(er)	2	2.33
Cohabitation	24	27.91
Level of education		
No official instruction	2	2.33
Primary	26	30.23
Secondary	34	39.53
University	24	27.91
Ethnicity		
Fon and related	72	83.72
Adja and related	3	3.49
Other	11	12.79

(75.58%) spent less than 6 hours a day in a sitting position. Among the workers, only 66 agreed to declare their salary bracket and 55 (83.33%) received more than the minimum wage. **Table 2** summarizes the professional information. Regarding psychosocial factors, 80 (93.02%) had low decision latitude, 17 (19.77%) had high psychological demands at work and 57 (66.28%) had low social support from their colleagues and hierarchy (see **Figure 1**). Job stress was found in 17 (19.77%) people.

3.3. Behavioral Characteristics

Among the workers, 21 (75.58%) had harmful alcohol consumption in the 30

days preceding the survey; 5 (5.81) smoked tobacco; 30 (65.12%) had excessive salt consumption, 41 (47.67%) had insufficient physical activity and 75 (87.21%) consumed less than 5 servings of fruits and vegetables per day. **Table 3** shows the distribution of workers according to their behavioral characteristics.

Table 2. Distribution of workers at the Bohicon town hall according to socio-professional and anthropometric characteristics in 2019; (N = 86).

	Number	Proportion (%)
Workstation		
Administrative staff	49	56.97
Support staff	11	12.79
Collecting agent	19	22.09
Other	7	8.14
Professional status		
Permanent	65	75.58
Occasional	12	13.95
Contractual	9	10.47
Shift work		
Yes	5	5.81
No	81	94.19
Length of time in position (years)		
≤10	69	80.23
>10	17	19.77
Monthly income (in FCFA)		
<45,000	11	12.79
[45,000 - 100,000[43	50
[100,000 - 400,000[12	13.96
Did not agree	20	23.25
Sex		
Men	27	31.4
Female	21	24.4
Daily sitting time at work (in hours)		
≤2	26	30.23
]2 - 3]	8	9.3
]3- 4]	14	16.28
]4 - 6]	17	19.77
>6	21	24.42

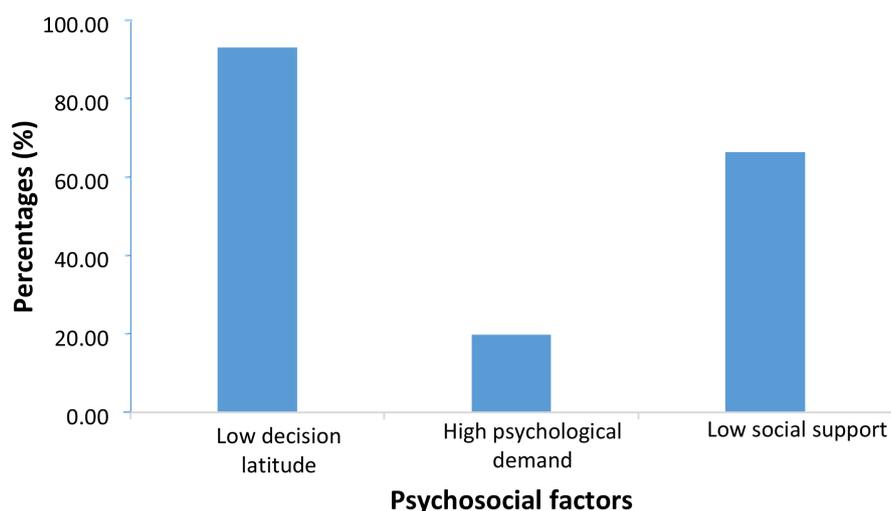


Figure 1. Psychosocial factors among city hall workers.

Table 3. Distribution of Bohicon city hall workers according to their behavioral characteristics in 2018; (N = 86).

	Number	Proportion (%)
Harmful use of alcohol		
Yes	21	75.58
No	65	24.42
Tobacco consumption		
Yes	05	5.81
No	81	94.19
Excessive salt consumption		
Yes	30	65.12
No	56	34.88
Physical activity		
Sufficient	45	52.33
Insufficient	41	47.67
Fruit and vegetable consumption		
Sufficient	11	12.79
Insufficient	75	87.21

3.4. Anthropometric and Clinical Characteristics

The average BMI of the workers was 23.93 ± 5.10 Kg/m². Among the workers, 52 (70.46%) were overweight. According to the IDF classification, 48 (55.81%) were abdominally obese, 21 of whom were women (75%) and 27 men (46.55%). A family history of hypertension was found in 21 (24.42%) and diabetes in 10 (11.63%).

Table 4 shows the distribution of workers according to their Anthropometric and

Table 4. Distribution of Bohicon city hall workers according to their anthropometric characteristics and family history of hypertension and diabetes in 2018; (N = 86).

	Number	Proportion
BMI		
Normal	34	39.53
Overweight	35	40.70
Obesity	17	19.76
Abdominal obesity by IDF score		
Yes	48	55.81
No	38	44.19
Family history of hypertension		
Yes	21	24.42
No	65	75.58
Family history of diabetes		
Yes	10	11.63
No	76	88.37

clinical characteristics.

3.5. Prevalence of Hypertension

Of the 86 workers, 17 were hypertensive, a prevalence of 19.77% $CI_{95\%}$ [11.96% - 29.75%] of whom 12 knew they were hypertensive before the survey.

3.6. Factors Associated with Hypertension

Among the socio-demographic, behavioral, occupational, anthropometric, and clinical variables studied, the prevalence of hypertension varied significantly with the following parameters: work stress: stressed at work (41.18%) versus those not stressed (14.49%) with $PR = 2.84CI_{95\%}$ [1.26 - 6.36]; and $p = 0.032$; overweight: workers in overweight (30.77%) versus those not overweight (02.94%) with $PR = 10.46CI_{95\%}$ [1.45 - 75.3] and $p < 0.001$; family history of hypertension: workers with family history of hypertension (38.10%) versus those without a family hypertension history (13.85%) with $PR = 2.75CI_{95\%} = [1.21 - 6.21]$ and $p = 0.034$. **Table 5** shows associated factors with hypertension in the workers.

The prevalence of hypertension among workers sitting daily for 6 hours was not significantly elevated compared with workers sitting daily for less than 6 hours. The same was true for workers with permanent status and workers with abdominal obesity.

4. Discussion

The objectives of this study were to determine the prevalence and factors associated with hypertension among workers at the Bohicon city hall. At the end of this

Table 5. HTA and associated factors among city hall workers in 2019 (N = 86).

	Total (N)	HTA		RP	IC95% RP	P
		n	%			
Socio-demographic factors						
Age ≥ 35 years	63	14	22.2	1.7	[0.53 - 5.39]	0.522**
Male gender	58	13	22.4	1.56	[0.56 - 4.37]	0.375***
Life as a couple	72	14	19.4	1.36	[0.35 - 5.33]	1.000*
Education level < second	28	5	17.9	0.86	[0.33 - 2.21]	0.757***
Professional factors						
Permanent status	65	16	24.62	5.17	[0.73 - 36.68]	0,094**
Seniority > 10 years	17	2	11.8	0.54	[0.13 - 2.14]	0.558**
Monthly income <100,000	53	9	17.0	0.4	[0.16 - 1.00]	0.112**
Sitting > 6 H/day	21	7	33,33	2.16	[0.94 - 4.97]	0.138**
Stress at work	17	7	41.2	2.84	[1.26 - 6.36]	0.032**
Behavioral factors						
Harmful use of alcohol	21	05	23.81	1.28	[0.51 - 3.23]	0.825**
Tobacco consumption	05	00	-	-	-	
Insufficient AP practice	41	09	21,95	1.23	[0.52 - 2.89]	0.627***
Excessive salt consumption	30	06	20.00	1.01	[0.41 - 2.48]	0.968***
Insufficient consumption FEL	75	15	20.00	1.10	[0.29 - 4.17]	0.968*
Anthropometric factors						
Overweight/Obesity	52	16	30.77	10.46	[1.45 - 75.3]	<0.001***
Abdominal obesity	48	13	27.08	2.57	[0.91 - 7.25]	0.055***
Clinical factors						
Family history of hypertension	21	08	38.10	2,75	[1.21 - 6.21]	0.034**
Family history of diabetes	07	03	42.86	2,38	[0.89 - 6.35]	0.139*

*Fisher; **Yates' Chi²; ***Pearson's chi².

study, the prevalence of hypertension was 19.77% and the factors significantly associated with it were work stress, overweight, and a family history of hypertension.

The prevalence of hypertension was lower than those of 32.52%; 25.3%; 41.90%; 54.1% and 49.3% respectively obtained by Kpozèhouen *et al.* [13] (Benin Ministry of Health, 2012); Hinson *et al.* (Cotonou Bank, 2016) [14] Kusuayi Mabele *et al.* (Kinshasa, 2015) [12] (Lubumbashi Congo, 2015); Ngombe *et al.* [18]. These differences could be explained by the diversities of the study populations, working conditions, and geographic location.

Age over 40 years is usually associated with AH. This has been observed by several authors in the occupational setting. This observation was made by Mbaye *et al.* in Senegal [19] Kusuayi Mabele *et al.* in Congo [12] Hinson *et al.* in Benin [14]. This association was not found in the present study, but a high prevalence according to age was noted, from 15.91% in subjects under 40 years of age to 23.81% in those over 40 years of age.

The prevalence of hypertension was higher in men than in women and was 22.41% and 14.29% respectively. But there was no statistically significant difference between gender and hypertension. Kusuayi Mabele *et al.* [12] obtained a prevalence of 45.4% in men and 37.5% in women without significant association. Maatoug *et al.* in 2014, Kpozèhouen *et al.* [13] and Mbaye *et al.* [19] also found a higher prevalence of hypertension in men with a significant difference.

According to the literature, hypertension is associated with low fruit and vegetable consumption, insufficient physical activity, and excessive salt consumption. These associations were not found in the present study. However, 87.21% of the workers consumed less than 5 portions of fruit and vegetables per day and 88.23% of the hypertensive workers had a low consumption of fruit and vegetables. Particular emphasis should be placed on education about fruit and vegetable consumption given their proven benefit.

Work stress has been associated with hypertension. Several authors have found similar results: Kusuayi Mabele *et al.* Congo, 2015 ($p = 0.038$); Hinson *et al.* (Cotonou, 2016, $p = 0.0027$) [12] [14]. The literature reports an association between stress in general and hypertension [20] [21] [22]. This association would be due to an increase in the secretion of cortisol by the large adrenals during periods of stress. A situation of chronic stress is thus at the origin of a permanently high cortisol level, which can lead to hypertension. Bautista *et al.* in 2019 found a prevalence of hypertension 2.23 times greater in people with high cortisol levels than in people with normal cortisol levels [23].

Workers who spent more than 6 h per day sitting at work were more likely to have hypertension although there was no significant association. Mbaye *et al.* identified 56.6% of sedentary workers among hypertensive workers. Also Bosu *et al.* in 2015 in Burkina Faso, showed that sedentary workers such as shopkeepers, bank employees and civil servants had a high risk of developing hypertension [9] [19].

A significant association between overweight and hypertension. This result corroborates the observations of Kusuayi Mabele *et al.* who found that the probability of being hypertensive was 5 times higher in obese workers ($p = 0.020$). Hinson *et al.* ($p = 0.010$) and Mbaye *et al.* ($p < 0.001$) also made the same observation [12] [14] [19]. BMI does not assess the distribution of fat in the body. Abdominal obesity was not associated with hypertension in our study. Indeed, 55.81% of the workers had abdominal obesity and the prevalence of AH was 2.57 times higher than the others. Even if the difference was not significant ($p = 0.055$), this aspect deserves to be taken into account. Kusuayi Mabele *et al.*; Hinson *et al.* also

found a significant association between abdominal obesity and hypertension [12] [14]. Abdominal obesity is therefore not negligible and awareness must be raised to inform about the dangers associated with this factor, which is wrongly considered in our country as a sign of “good living”.

A family history of hypertension was associated with hypertension in our study ($p = 0.034$). Kpozèhouen *et al.* also found a significant association between hypertension and a history of hypertension in siblings ($p = 0.0001$) and in ascendants ($p = 0.001$) [13]. In the general population, Ahoui *et al.* and Yayehd *et al.* in 2011 found similar results to ours ($p = 0.000$ and $p < 0.001$ respectively) [24] [25].

Following the results of the study, an awareness campaign for workers on the risk factors of non-communicable diseases was carried out and an action plan was submitted to the managers, including the need to set up an occupational health service within the city hall.

This study provides information on hypertension among workers in the Bohicon city hall. The main strengths of this study were the consideration of occupational factors and the awareness-raising actions conducted after the survey. However, the study has some limitations. The study included only one blood pressure screening event. It is possible that some workers developed symptoms later and developed hypertension. Information bias may be introduced because of misreporting of workers' lifestyle habits. As this is a cross-sectional study, a causal relationship cannot be established.

5. Conclusion

This study shows that there is a significant association between work stress, obesity and high blood pressure. The implementation of workplace non-communicable disease prevention programs should also address occupational factors in addition to other risk factors. Indeed, the good health of the worker is always beneficial to the company.

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Conflicts of Interest

The authors declare no conflicts of interest regarding the publication of this paper.

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