



# A Cross-sectional Study of the Epidemiological Characteristics of Hypertension in a Mass Screening of Adult Volunteers at the Renaissance University Hospital

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**Abstract:** *Introduction:* Hypertension is a major public health problem and an important area of research due to its high prevalence. It remains to be the leading cause of death globally and a major risk factor for cardiovascular morbidity and mortality associated with other complications. Its management is a major challenge in our society; the large disparities in the regional burden of hypertension are accompanied by low levels of awareness, treatment and control rates. The objective of this study was to determine the epidemiological characteristics of hypertension and its associated risk factors. This is a cross-sectional study conducted at the Renaissance University Hospital in June 2021 during a screening campaign and to raise awareness for hypertension. Its adult volunteers aged 18 years and older were present. The data was collected individually by interview using a collection form. *Results:* The sample consisted of 350 volunteers with 227 males (64.86%) with a sex ratio of 1.84. The mean standard deviation of total age was 38.96 (12.31) years. The prevalence of hypertension was present in 22.28% of participants (n=78). Male was predominant among hypertensive individuals (65.38%) and the mean standard deviation age of hypertensives was 42.85 (13.42) years. Associated risk factors were predominantly hyperglycaemia; 26.9% of cases (n=94), alcohol consumption; 23.43% of cases (n=82) and obesity; 16% of cases (n=56). *Conclusion:* This study shows a high prevalence of hypertension and it concerns predominantly males. It affects young adults and the main associated cardiovascular risk factors were age, obesity, alcohol consumption and hyperglycaemia.

**Keywords:** Hypertension, Screening, Cardiovascular Risk Factors, N'Djaména, Chad

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## 1. Introduction

High blood pressure (HBP) is a global public health problem. More than a quarter of the world's adult population is hypertensive, and this proportion is expected to increase in the coming years. Sub-Saharan Africa is no exception to this trend; 150 million patients will suffer from hypertension in 2025 [1, 2]. It is the most frequent cardiovascular risk factor, having a strong impact on the epidemiological transition in

developing countries, along with diabetes and smoking [3]. It is the leading chronic disease in the world. It increases the risk of stroke, coronary heart disease, heart failure, renal failure and cognitive impairment [4-8].

In Chad, the prevalence of hypertension is unknown. This study conducted in the general population at the Renaissance University Hospital, aimed to determine the epidemiological characteristics of hypertension and its associated risk factors.

## 2. Methodology

This is a cross-sectional study conducted in June 2021 at the Renaissance University Hospital, during a blood pressure screening campaign for hypertension on adult volunteers. The medical team was composed of three (3) Cardiologists, seven (7) General Practitioners, seven (7) medical students and ten (10) registered nurses.

Data was collected by an individual interview using a collection form. In all subjects, blood pressure measurements were taken on both arms in a sitting position with the arms flexed at the elbow and supported at the heart level on the chair using an OMRON electronic device. Blood pressure was measured three times at 2 min intervals and the average of the two last measurements was taken on the side where the blood pressure was initially higher.

### 2.1. The Variables

Demographic characteristics of age, sex, education, lifestyle; smoking or alcohol consumption, personal and family history of hypertension or diabetes, capillary glucose and body mass index (BMI).

### 2.2. Definitions

Hypertension is defined as systolic BP  $\geq 140$  mmHg and/or diastolic BP  $\geq 90$  mmHg according to the criteria of the European Societies of Hypertension and Cardiology Guidelines (ESH/ESC 2018) [9]. Hyperglycaemia is a condition in which an excessive amount of glucose circulates in the blood plasma and is defined as a fasting blood glucose  $\geq 1.26$  g/l or random blood glucose  $\geq 2$  g/l; individuals with a BMI 25.0–29.9 kg/m<sup>2</sup> was defined as overweight and BMI  $\geq 30.0$  kg/m<sup>2</sup> as obese.

### 2.3. Ethical Issues

Confidentiality of participants' data was respected according to the requirements of the Declaration of Helsinki II.

#### Statistical Analysis

Data analysis was performed with the use of the SPSS version 18.0 software. All continuous variables are presented as a mean standard deviation and categorical variables are presented as numbers (percentages). Frequencies of categorical variables were analyzed by a Chi-squared test where a P-value  $\leq 0.05$  was considered to be statistically significant.

## 3. Results

### 3.1. General Characteristics of the Population (Table 1)

The study group consisted of 350 volunteers, 227 men (64.86%) and 123 women (35.14%) with a sex-ratio of 1.84. The mean age was 38.96 with a standard deviation of 12.31 years with extremes between 18 to 80 years. Subjects under 35 years old were more represented and accounted for 44.6% (n=156). Higher education was noted in 61.7% of cases (n=216).

**Table 1.** Characteristics of individuals.

Characteristics	N (350)	(%)
Sex		
Female	123	35.14
Male	227	64.86
Age range		
<35	156	44.57
35-50	127	36.28
50-65	57	16.28
$\geq 65$	10	2.85
Educational level		
Unschooling	29	8.28
Primary	15	4.28
Secondary	90	25.71
High	216	61.71

### 3.2. Frequency of Hypertension and Associated Cardiovascular Risk Factors (Table 2)

Hypertension was present in 22.28% of the participants (n=78) of whom 39.74% (n=31) were aware of their hypertensive status but were not monitored. The hypertensive patients were predominantly 51 males and 27 females while the sex ratio was 1.88. The mean age of the hypertensive patients was 42.85 years, with a standard deviation of 13.42 years.

The other risk factors were respectively hyperglycaemia 26.9% (n=94), alcohol consumption 23.43% (n=82), obesity 16% (n=56) and smoking 6% (n=21). In the family history, we noted 96 cases of diabetes (27.43%) and 115 cases of hypertension (32.86%). Smoking, hyperglycaemia and hypertension were significantly more common in men (p<0.05) than women (Table 3).

**Table 2.** Frequency of hypertension and other cardiovascular risk factors.

Variable	N (350)	(%)
HBP	78	22.28
Hyperglycemia	94	26.85
Alcohol	82	23.43
Smoking	21	6
Obesity	56	16
Family history		
Diabetes	96	27.43
HBP	115	32.86

**Table 3.** Cardiovascular risk factors expressed as percentage and p-value for comparison in males and females.

Variable	Male: n=227 (%)	Female: n=123 (%)	Total: n=350 (%)	P-value
HBP	51 (14.57)	27 (7.71)	78 (22.28)	0.007
Hyperglycemia	50 (14.28)	44 (12.57)	94 (26.85)	0.006
Alcohol	58 (16.57)	24 (6.86)	82 (23.43)	0.203
Smoking	19 (5.43)	2 (0.6)	21 (6)	0.011
Obesity	23 (6.57)	33 (9.43)	56 (16)	0.02

### 3.3. Association of Hypertension and Cardiovascular Risk Factors (Table 4)

The prevalence of hypertension increases with age; the proportion of hypertensive patients under 35 years of age was 10.9% versus 70% over 65 years of age. Those associated with hyperglycaemia; the proportion of

hypertensives was 35% in subjects with hyperglycaemia versus 17.6% in subjects with normal blood glucose levels. Body mass index is positively associated with high blood pressure; 18.7% in subjects with a normal BMI to 35.7% in subjects that are overweight or obese. Therefore, there is an increasing gradient with high blood pressure and higher levels of BMI.

**Table 4.** Relationship between hypertension and other cardiovascular risk factors.

Variable	HBP; N (%)		P
	No	Yes	
Age range			
<35	139 (39.71)	17 (4.86)	0.002
35-50	95 (27.14)	32 (9.14)	
50-65	35 (10)	22 (6.28)	
≥65	3 (0.86)	7 (2)	
Hyperglycemia			
Yes	61 (17.43)	33 (9.43)	0.004
No	211 (60.28)	45 (12.86)	
BMI			
<25	152 (43.43)	35 (10)	0.027
25-30	84 (24)	23 (6.57)	
≥35	36 (10.28)	20 (5.71)	

## 4. Discussion

This campaign enabled us to screen 350 participants. The study population was relatively young adults; 44.57% of the subjects are less than 35 years of age, with a male predominance of 64.85%, education; 87.43% of participants have at least a secondary level of education, and therefore potentially active.

Our findings showed that the prevalence of hypertension was 22.28%. This proportion is similar to the 20.4% found in Côte d'Ivoire [10]. However, it is lower than the results reported by authors in Nigeria, Congo, Togo and Benin, which are 36.2%, 41%, 36.7% and 34.8% respectively [11-14]. This difference can be explained by the fact that there was a small number of participants in our study. Almost 40% of hypertensive patients were aware of their diagnosis but were not on any antihypertensive medications or follow-up. The same observation has been made by several African authors [10-12]. It seems that hypertension is often neglected in Sub-Saharan Africa because hypertensive patients are often not treated, and those who are treated are not well controlled.

Our study revealed a male predominance in hypertensive patients with 51 males versus 27 females, and the sex ratio was 1.88. This male predominance has been found in several Sub-Saharan African countries [15, 16].

The mean age of hypertensive individuals in our study was 42.85±13.42 years. This average age corroborates with that observed by Yayehd K et al, in Togo in 2011; 48.96±12.99 years [14] and by Ogah OS et al, in Nigeria in 2017; 40.9±14.4 years [11].

Hypertension is significantly higher in the elderly. The proportion of individuals with hypertension in this study increases from 10.9% in those under 35 years of age to 70%

in those over 65 years of age. This increased risk of hypertension was demonstrated by Yayehd K et al, in Togo in 2011 [14], by Niakara et al, in Burkina-Faso in 2002 [17] and by Longo-Mbenza et al, in the Democratic Republic of Congo in 2006 [18].

We observed a statistically significant association between hypertension and hyperglycaemia with a rate of 35% of hypertensive individuals with hyperglycaemia, and between hypertension and body mass index with a rate of 35.7% of hypertensive individuals who are overweight or obese. This association between hypertension and other cardiovascular risk factors such as age, alcohol consumption, obesity and diabetes is well known [12, 19, 20].

Mass screening campaigns offer opportunities for early diagnosis and awareness of the associated cardiovascular risk factors. Furthermore, they allow prevention, education and management of those who were detected.

### Limitations

This is a cross-sectional study with a small number of participants and the data provided cannot be extrapolated to the whole country.

## 5. Conclusion

This study shows that the prevalence of hypertension is high with a predominance to males. It mostly affects older adults and the main cardiovascular risk factors associated were age, hyperglycaemia and obesity. The systematic screening of hypertension and its associated risk factors allows for better treatment and management.

## Competing Interests

The authors declare that they have no conflict of interests.

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