

## RESEARCH ARTICLE

# Prevalence of hypertension in N'Djamena, Chad: Screening campaign among adult volunteers from the general population

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## Abstract

**Introduction:** Hypertension (HTN) or high blood pressure (BP) is a common and serious pathology if not treated. World Health Organization estimated that 1 in 4 men and 1 in 5 women have hypertension. The objective of this study was to describe and determine the epidemiological characteristics of hypertension and its associated cardiovascular risk factors.

**Patients and methods:** This free screening campaign was carried out at the Renaissance University Hospital Center in March 2023, in N'Djamena, Chad, which involved adult volunteers aged 18 years and above. The data was collected during an individual interview by using a data collection sheet. Individuals were interviewed for sociodemographic data, medical and family history, and lifestyle habits. Then we proceeded to the measurement of blood pressure and the anthropometric parameters. Anthropometric parameters and triplicate sitting blood pressure (BP) measurements taken in succession, separated by at least 2 minutes, were obtained using validated electronic blood pressure devices.

**Results:** The sample consisted of 744 volunteers with usable records. There were 520 men (69.9%) and 224 women (30.1%), giving a sex ratio of 2:3. The mean age was  $41.9 \pm 13.2$  years. Individuals aged 35 years and under were the most common with 37.5% of cases (n=279). The frequency of hypertension was 43.8% (n=326). The male sex was predominant with 220 men (67.5%). The mean age of hypertensive individuals was  $47.2 \pm 13.1$  years. Hypertension was associated with hyperglycaemia (58.8%), obesity (64.9%) and older age (70% in those over 65 years and 26.2% in those under 35 years).

**Conclusion:** This screening campaign based on the voluntary participation of individuals from the general population shows that the prevalence of hypertension is high. Those affected are mostly young. The main cardiovascular risk factors associated with hypertension are age, hyperglycemia and obesity.

**Keywords:** arterial hypertension; N'Djamena; Chad

## Introduction

Arterial hypertension (HTN) is a common and serious pathology [1]. It is a global public health problem [2]. It is one of the most common worldwide diseases afflicting humans and is a major risk factor for stroke, vascular disease, myocardial infarction, chronic kidney disease and premature death. It is the first chronic disease in the world. This does not spare sub-Saharan Africa, because according to several studies, the prevalence of hypertension continues to increase in this region of the world [3-5]. It is responsible for many complications such as coronary disease, heart failure, kidney failure and sudden death [6-10]. The hypertension screening campaigns allow its early diagnosis and therefore its appropriate treatment and the awareness of the population. Indeed, most often patients are unaware of their hypertensive status and more than half of the treated hypertensives have uncontrolled blood pressure [11,12]. In Chad, epidemiological studies carried out in the general population are rare and the prevalence of hypertension is not known. The objective of this study was to describe the epidemiological characteristics of hypertension and its various associated cardiovascular risk factors that can become focus of interventions to curtail the emergence of cardiovascular events at an early age. Awareness creations through health and nutrition education is emphasized.

## Methodology

This free screening campaign was performed at the Renaissance University Hospital Center in March, 2023. It included adult volunteers aged 18 years and above who presented themselves at the site of the campaign. The screening team was made up of three (3) cardiologists, twelve (12) general practitioners, fourteen (14) 7th year medical interns and twenty-two (22) certified nurses. The data was collected during an individual interview using a data collection sheet.

Individuals were interviewed for sociodemographic data, medical and family history, and lifestyle habits. Then we proceeded to the measurement of blood pressure and anthropometric parameters. The blood pressure was measured on both arms after an average of 15 minutes of rest in a seated position, by validated Omron electronic devices. After 3 consecutive measurements separated by 2 minutes each, the average of the last two measurements was retained on the side where the blood pressure was initially higher. At the end of screening, advice was given to all participants on physical activity, dietary measures and lifestyle changes. Among them, some received immediate care, while others were referred for a medical consultation in the Cardiology Department.

## The variables studied

Sociodemographic (age, sex, level of education, socio-economic status, marital status), lifestyle habits (consumption of tobacco and alcohol, drug treatment), unhealthy diets (excessive salt consumption, a diet high in fats, low intake of fruits and vegetables), medical or family history of hypertension and diabetes (father, mother, or collaterals), blood pressure, capillary blood glucose, body mass index (BMI).

## Operational definitions

Hypertension was retained for high blood pressure greater than or equal to 140/90 mmHg according to the recommendations of the European Society of Hypertension and Cardiology (ESH/ESC 2018) [13]; hyperglycemia was defined as a high fasting capillary blood glucose greater than or equal to 1.26 g/l or random blood glucose level greater than or equal to 2 g/l; the BMI was obtained by dividing the weight in kilograms by the square of the height in meters and obesity was defined by a BMI greater than or equal to 30 kg/m<sup>2</sup>.

## Ethical considerations

The confidentiality of participant data was respected according to the requirements of the Declaration of Helsinki II.

## Statistical analysis

Data was collected by using a Microsoft Office Excel software and analyzed using a SPP 18.0 software. Quantitative variables were expressed as a mean  $\pm$  standard deviation; qualitative variables was in percentages. The statistical relationship between the association of hypertension and other risk factors was studied by a Chi-square test. The threshold of a  $p$ -value  $\leq 0.05$  was considered statistically significant.

## Results

The sample consisted of 780 volunteers with only 744 usable records. There were 520 men (69.9%) and 224 women (30.1%), with a sex ratio of 2:3. The average age was  $41.9 \pm 13.2$  years with extremes between 18 to 89 years. Individuals aged under 35 were the most represented with 37.5% of cases ( $n=279$ ), while the higher level of education was noted in 57.1% of cases ( $n=425$ ) (Table 1).

The frequency of hypertension and its associated cardiovascular risk factors is shown in table 2. The frequency of hypertension was 43.8% ( $n=326$ ) of which 38.6% ( $n=126$ ) knew their hypertensive status. The male sex was predominant, 220 men (67.5%) and 106 women (32.5%) or a sex ratio of 2.1. The mean age of hypertensive individuals was  $47.2 \pm 13.1$  years. Other risk factors were noted; hyperglycemia; 26.1% of cases ( $n=194$ ), alcohol consumption; 25.3% of cases ( $n=188$ ), obesity; 18% of cases ( $n=134$ ) and smoking, 8.3% of cases ( $n=62$ ). In the family history, we noted 29.7% of cases ( $n=221$ ) of diabetes and 36% of cases ( $n=268$ ) of hypertension.

There was no association between hypertension and gender ( $p = 0.206$ ). The consumption of tobacco, alcohol and hyperglycaemia were significantly more reported in men ( $p < 0.05$ ). On the other hand, obesity was statistically higher among women (Table 3).

Association of hypertension and its cardiovascular risk factors is shown in table 4. Hypertension increases with age, that is why the proportion of hypertensives increases from 26.2% in those under 35 years of age to 70% in those over 65 years of age. Moreover, among the cardiovascular risk factors, only hyperglycemia and obesity had a statistically significant relationship with hypertension. Indeed, the hypertension rate was 58.8% in individuals with hyperglycemia against 38.5% in individuals with normal blood glucose levels. In relation to the body mass index (BMI), its proportion goes from 32.5% in individuals with a normal BMI to 64.9% in individuals that are obese.

The association between hyperglycemia and a body mass index is shown in table 5. There was an association between a high blood glucose level and BMI. Indeed, the proportion of those with high blood glucose level is 19.6% when the BMI is normal against 35.8% when the individuals are obese ( $p < 0.05$ ).

**Table 1:** Sociodemographic Variables

Variables	Numbers( $n=744$ )	Percentage (%)
<b>Sex</b>		
Female	224	30,1
Male	520	69,9
<b>Age range</b>		
< 35	279	37,5
35-50	273	36,7
50-65	152	20,4
$\geq 65$	40	5,4
<b>Educational level</b>		
None	94	12,6
Primary	42	5,6
Secondary	149	20
Superior	425	57,1

**Table 2:** Frequency of hypertension and its associated cardiovascular risk factors

Variables	Numbers (n)	Percentage (%)
HTN	326	43,81
Hyperglycemia	194	26,1
Alcohol	188	25,3
Obesity	134	18
Tobacco	62	8,3
Family History;		
Diabetes	221	29,7
HTN	268	36

**Table 3:** Association between gender and the cardiovascular risk factors

Variables	Male; n (%)	Femal; n (%)	Total; n (%)	$p$ -value
HTN	220 (67,5)	106 (32,5)	326 (100)	0,206
Hyperglycemia	119 (61,3)	75 (38,7)	194 (100)	0,003
Alcohol	149 (79,3)	39 (20,7)	188 (100)	0,001
Tobacco	58 (93,5)	4 (6,5)	62 (100)	0,001
Obesity	60 (44,8)	74 (55,2)	134 (100)	0,001

**Table 4:** Association of hypertension and cardiovascular risk factors

Variables	HTN; n (%)		$p$ -value
	(No)	(Yes)	
<b>Age range</b>			
<35	206 (73,8)	73 (26,2)	0,001
35-50	157 (57,5)	116 (42,5)	
50-65	43 (28,3)	109 (71,7)	
$\geq 65$	12 (30)	28 (70)	
<b>Hyperglycemic</b>			
Yes	80 (41,2)	114 (58,8)	0,001
No	338 (61,5)	212 (38,5)	
<b>BMI</b>			
Normal	231 (67,5)	111 (32,5)	0,001
Overweight	140 (52,5)	128 (47,8)	
Obese	47 (35,1)	87 (64,9)	

**Table 5:** Association between blood glucose and BMI

BMI	Glucose levels		Total; n (%)	$p$ -value
	Normal; n (%)	Elevated; n (%)		
Normal	275 (80,4)	67 (19,6)	342 (100)	0,001
Overweight	189 (70,5)	79 (29,5)	268 (100)	
Obesity	86 (64,2)	48 (35,8)	134 (100)	

## Discussion

During this screening campaign, we studied 744 records out of a total of 780 participants. The study population was mostly young with an average age of  $41.9 \pm 13.2$  years and 37.5% of the individuals were under 35 years old. The predominance was males; 69.9% of men. More than 50% of the participants had a higher level of education.

The prevalence of hypertension was 43.8%. Similar results have been found in some African countries such as 41% in Congo in 2019 [14], 34.8% in Benin in 2018 [15], 36.2% in Nigeria in 2017 [16], 36.7% in Togo in 2011 [17] and 38.3% in Gabon in 2009 [18]. This high prevalence of hypertension in sub-Saharan Africa, which is similar to that of European countries [19], testifies to the epidemiological transition which is becoming worrying.

More than a third of the participants were known but poorly controlled hypertensives. This observation corroborates the data found in the African literature [14,16,20]. Indeed, hypertension remains an unknown pathology in our context because even those who knew their hypertensive status do not have appropriate therapeutic management

[11,12]. This is probably related to the lack of awareness and the difficulties inherent in the inaccessibility of drugs.

The predominance of hypertensives was males with 67.5% of cases, with a sex ratio of 2:1. Indeed, this proportion of the male sex corresponds to the results of several studies carried out in sub-Saharan Africa [21,22]. However, other African authors have found a female predominance [17,23]. In this study, the increased prevalence of hypertension in men could be explained by the fact that more than two thirds of the participants were young and male. Further studies will be needed to better assess this observation.

The mean age of hypertensives was  $47.2 \pm 13.1$  years. This average age confirms data found in African and European studies [15,17,24]. The prevalence of hypertension increases with age. We found that its proportion increases in subjects aged 65 (70%) compared to those aged under 35 (26.2%). Indeed, there is a linear relationship between age and hypertension due to three main factors; greater sodium sensitivity with age, endothelial dysfunction modifying the capacity of the arteries to dilate and an increase in vascular rigidity [25,26].

In bivariate analysis, we noted that hypertension was associated with hyperglycemia and obesity. Similar results, particularly the association of hypertension with age, excessive alcohol consumption, obesity and diabetes, have been reported by other authors [14,16,27-29].

Cardiovascular risk factors, in particular hypertension, are the cause of significant morbidity and mortality. Reducing this morbidity and mortality requires early diagnosis of these cardiovascular risk factors and their management. Mass screening and awareness campaigns about these cardiovascular risk factors must be extended throughout the national territory and included as a priority among the actions of the health system in order to obtain an ample database and identify strategies for prevention and therapeutic management.

## Limits

It is a single-center study that focused on an unselected group of the population in N'Djamena with a limited number of participants whose data provided cannot be extrapolated to the scale of the country. The diagnosis of hypertension was retained only on the average of three blood pressure measurements in a single session without resorting to other means of diagnosis such as a self-measured blood pressure or an ambulatory blood pressure monitoring.

## Conclusion

This study based on the voluntary participation of the individuals shows that the prevalence of hypertension is high (43.8%). Affected individuals are most often young with an average age of 47.2 years. The main cardiovascular risk factors that are associated with hypertension are age, hyperglycemia and obesity.

## Conflict of Interest

There were no conflict of interests regarding the publication of this article.

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