

# Risk Factors and Public Assistance Role in Hypertension among Homeless Population: A Cohort Study

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## ARTICLE INFO

**Received:**  January 11, 2020

**Published:**  January 21, 2020

**Citation:** Ebraheem Naser, Andrew Aboujaoude, Leticia Lenkiu, Jennifer Carvel, Mary Cobty, Maliha Avais, Sayf Al-Deen Hassouneh, Ahmad Qasem, Saleh A Naser. Risk Factors and Public Assistance Role in Hypertension among Homeless Population: A Cohort Study. Biomed J Sci & Tech Res 24(4)-2020. BJSTR. MS.ID.004099.

**Keywords:** Communicable Diseases; Cardiovascular Disease; Hypertension; Blood Pressure; Diastolic Blood Pressure

**Abbreviations:** WHO: World Health Organization; BMI: Body Mass Index; SBP: Systolic Blood Pressure; DBP: Diastolic Blood Pressure

## ABSTRACT

The Homeless population is the most socioeconomic underprivileged community in the United States. Cardiovascular complications are one of the leading causes of death among homeless individuals. This study highlights the major risk factors of hypertension among the homeless community in the Orlando metropolitan area, in order to provide solutions and to modify associated risk factors. Adult homeless individuals (N=167) were randomly selected during daily lunch shares at St. George Orthodox Church, Orlando Florida. Each consented participant completed a survey with inquiries about demographic, lifestyle and hypertension related risk factors. Blood pressure was measured twice using an automatic Welch Allyn Connex ProBP 2400 digital device and the readings average was calculated. The Body Mass Index (BMI) was also calculated according to the World Health Organization (WHO) criteria. Average age of participants was  $42.3 \pm 11$  years, and 83% were men. The overall prevalence of hypertension among participants was 52% (87 out of 167). The prevalence of hypertension among individuals who reported to be homeless over one year was 73% (38 out of 52), compared to only 51.3% among those with less than one year. Among diabetic homeless, 70% suffers from hypertension. The prevalence of hypertension among smokers was 51% (48 out of 95), while hypertension according to BMI group was significantly higher in both overweight and obese groups compared to individuals with normal BMI. Hypertension was significantly prevalent among homeless receiving no assistance (75.67%) compared to those receiving both financial and social assistance (47.61%). However, financial assistance had a major effect on lowering hypertension prevalence in comparison to social assistance (58.62% and 74.41%, respectively). In conclusion, hypertension is prevalent among Orlando homeless cohort and it has surpassed the national average. Clearly, social and financial services seem to lower hypertension prevalence among homeless individuals receiving benefits. The outcome of the study supports data from other countries offering affordable and accessible health care services, and certainly, it renews the call for more resources to help the homeless communities.

## Introduction

Homelessness is defined as a condition of people living without any regular nighttime residence [1]. As of 2017, there were around 550,000 homeless individuals in the United States, which is

considered 0.17% of the total population [1,2]. Studies addressing the health risks of homelessness are very limited. Homeless individuals are prone to developing chronic disease conditions,

communicable diseases and substance abuse [3-5]. Since there is a strong correlation between socioeconomic status and health, it is not surprising that homeless individuals are facing a heavy disease burden, which requires a distinctive approach to fulfill their health care needs [6]. Among the most common chronic illnesses affecting homeless people is cardiovascular disease [7]. However, the risk factors associated with its manifestations are generally unidentified [3]. Most of homeless people are lacking health insurance, which results in deadly consequences of cardiovascular disease specifically [3]. For instance, hypertension is estimated to affect between 18% to 41% of the homeless population [8]. Hypertension has been found to be a leading risk factor for death worldwide [9,10]. Consequently, homeless individuals have an average life expectancy of 42 to 52 years old, almost 30 years less than the average American [8].

This study was designed to determine the prevalence of hypertension among the homeless community of downtown Orlando area, where 1500 individuals are estimated to be homeless. Additionally, we wanted to identify certain risk factors inducing the development of hypertension among these individuals. Ultimately, this could help educating the public about this issue, which will potentially assist the city to develop more effective and efficient solutions, that they might not have been considered earlier.

## Materials and Methods

### Enrollment of Study Participants

All participants in this study were self-identified as homeless adults residing in Orlando Downtown, Florida. All participants have consented to be enrolled in the study following an approved Institutional Review Board from the University of Central Florida (IRB00001138). All participants were interviewed and selected for the study following approved inclusion/exclusion criteria defined in the IRB protocol and the consent form. Exclusion criteria includes those who were under the age of 18 years old, pregnant women, had permanent housing, had received mastectomies, and had consumed alcohol on that day. Additionally, we conducted a brief visual check to ensure that participants' left arm were not amputated and that they were not suffering from any present ablations or cuts that may lead to complications if the blood pressure was measured. To conduct the study effectively, we aimed to recruit a sizeable and representative sample of the Orlando homeless community. Thus, with the permission of the St. George Orthodox Church (Orlando, Florida), we conducted the study on their property during their daily food shares. Recruitment took place between January 22<sup>nd</sup>, 2018 and February 26<sup>th</sup>, 2018.

Each participant was asked to complete a survey form, which included questions in regard to smoking, alcohol consumption, diet habits, veteran status, diabetes history, high blood pressure history, financial support, social support, current medications, cause of homelessness, duration of homelessness, weight, and height. The Body Mass Index (BMI) was calculated according to the World

Health Organization (WHO) criteria. Blood pressure measurement Blood pressure was measured twice in one setting, by using an automatic Welch Allyn Connex ProBP 2400 digital device. Each participant was seated, and blood pressure sanitized cuff was securely wrapped around the left arm, then Systolic Blood Pressure (SBP) and Diastolic Blood Pressure (DBP) were documented accordingly.

### Statistical Analysis

First, we quantified the responses to each survey question, which indicated the prevalence of certain factors, behaviors, or characteristics within the sample that effectively represents the Orlando homeless community. Data are expressed as mean  $\pm$  standard error of the mean by using graphpad prism<sup>®</sup>. Two tailed student's t-test was used. The difference between samples and controls was considered statistically significant at a level of \* $P < 0.05$ . In order to compare between the homeless population and the non-homeless population (derived from other studies), a Z-Test for two population proportions was conducted to determine if there was a statistically significant difference.

## Results

### Presence of Hypertension Among Homeless Population

Of over 200 individuals were interviewed, 167 agreed to participate in this study. Demographics of study participants are listed in Table 1. The average age of participants was  $42.3 \pm 11$  years, and 83% were men. Physical and social characteristics of study participants are listed in Table 2. Evaluated based on a mean systolic blood pressure of higher than 130 mm Hg or a mean diastolic blood pressure of higher than 80 mm Hg, 52% (87 out of 167) of homeless individuals had hypertension. Additionally, 33 (20%) individuals were in a prehypertension stage (SBP 120–129 and DBP  $< 80$  mm Hg). Surprisingly, only 7 individuals (4%) out of those were aware of their hypertension and currently taking antihypertensive medication. The prevalence of hypertension among individuals who reported to be homeless over one year was 73% (38 out of 52), which is significantly higher than individuals who were homeless for less than a year (51.3%) (Figure 1A).

**Table 1:** Participant Demographics.

Participants	Number
All Subjects	167
Gender	
Male	132
Female	28
Undetermined	7
Age	
Range	18 - 74
Mean $\pm$ SD	$42.3 \pm 11$
18 - 30	24
31 - 50	71

51 – 70	66
70 – 74	6
<b>Duration of Homelessness</b>	
Less than one year	78
One to five years	52
Over 5 years	37

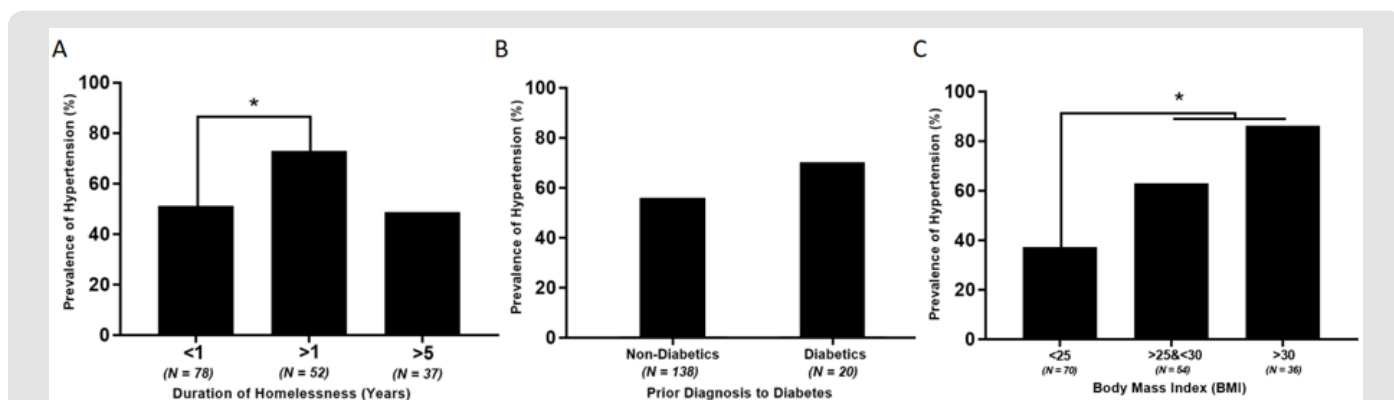
Underweight (<18.5)	4
Normal (18.5–24.9)	66
Overweight (25.0–29.9)	54
Obese (≥30.0)	36
Not measured	7

**Table 2:** Physical and Social Characteristics of Study Participants.

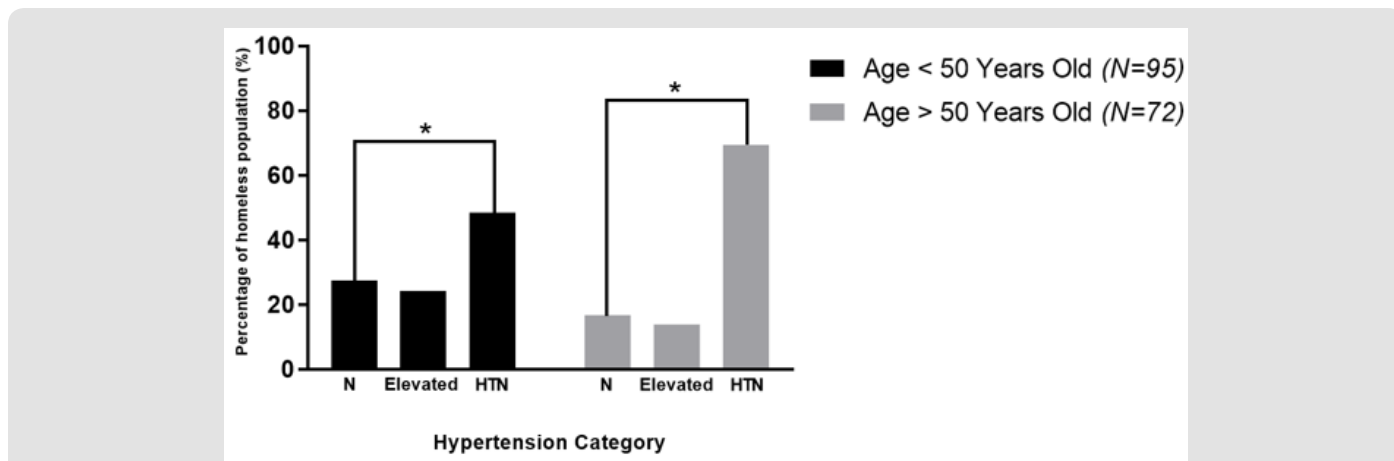
Factor	Number
<b>Blood Pressure</b>	
Normal (SBP <120 and DBP <80 mm Hg)	38
Prehypertension (SBP 120–139 or DBP 80–89 mm Hg)	33
Stage 1 hypertension (SBP 140–159 or DBP 90–99 mm Hg)	36
Stage 2 hypertension (SBP ≥160 or DBP ≥100 mm Hg)	51
<b>Prior diagnosis to Diabetes</b>	
Diabetics	20
Non-Diabetic	147
<b>Smoking</b>	
Smokers	95
Non-Smokers	72
<b>Body Mass Index (BMI)</b>	

**Effects of Diabetes, Smoking, Bmi And Age on Hypertension Prevalence**

The prevalence of self-reported diabetic patients among the homeless population was 12% (20 out of 167), 70% (14 out of 20) of those patients were found to have hypertension (Figure 1B). The prevalence of cigarette smoking among homeless population was 45% (95 out of 167). The prevalence of hypertension among those was 51% (48 out of 95). The BMI of 54% (90 out of 167) of homeless individuals met WHO criteria for being overweight or obese (BMI ≥ 25). On the other hand, only 4 individuals (2.4%) were underweight (BMI < 18.5). The presence of hypertension according to BMI group was significantly higher in both overweight and obese groups compared to normal BMI group (Figure 1C). Individuals who were over the age of 50, had significantly higher prevalence of hypertension compared to those under 50 (69.4% vs 48.42%, respectively), although hypertension is still significantly prevalent within each group (Figure 2).



**Figure 1:** Effect of homelessness duration (A), Body mass index (B) and Prior diagnosis to diabetes (C) on hypertension prevalence among homeless individuals.



**Figure 2:** Distribution of hypertension categories according to age groups.

## Hypertension Prevalence Among Individuals Receiving Financial and Social Assistance

Out of 167 surveyed individuals, 29 (17.4%) have reported to receive financial assistance from designated authorities, while 43 (25.7%) have reported to receive social assistance. Additionally, 21 (12.57%) have reported to have both social and financial

assistance, while 74 individuals were not receiving any assistance. Hypertension was significantly prevalent among individuals receiving no assistance (75.67%) compared to individuals receiving both financial and social assistance (47.61%). However, financial assistance had a major effect on lowering hypertension prevalence in comparison to social assistance, since it was 58.62% and 74.41%, respectively (Figure 3).

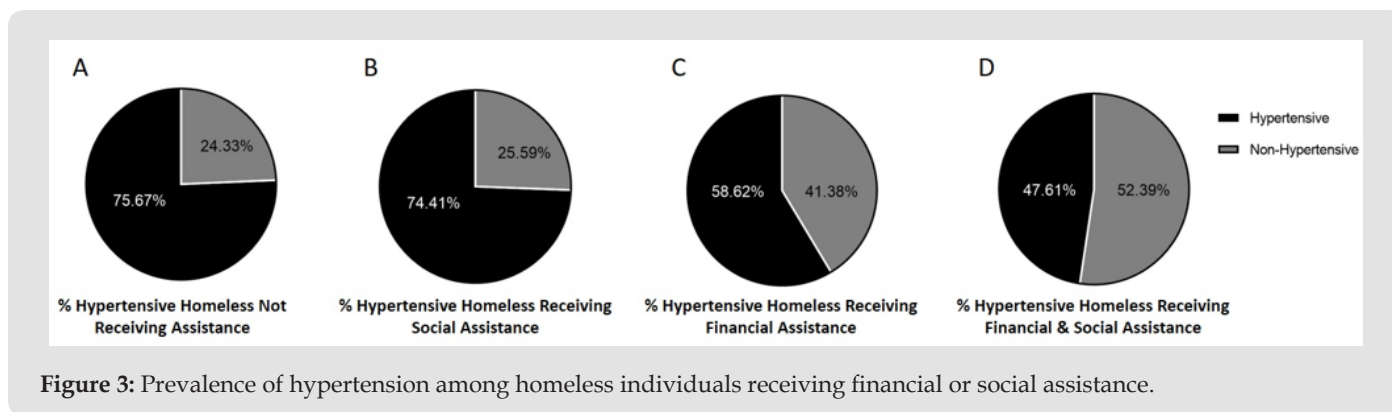


Figure 3: Prevalence of hypertension among homeless individuals receiving financial or social assistance.

## Discussion

Several research studies have focused on elucidating the socioeconomic discrepancies in prevalence of risk factors leading to cardiovascular disease [11,12,13]. Nevertheless, a small attention has been paid to study those risks among the homeless population, which represents the most socioeconomic underprivileged community in the United States [14,15]. This study, which is one of the first to assess risk factors of hypertension among homeless individuals in Orlando metropolitan area, demonstrates high prevalence of major risks in this community. The prevalence of hypertension was significantly higher among the homeless population regardless of age group, although it was higher in individuals over 50 compared to those under 50 years old. It is noteworthy to mention that only 7 individuals were aware of their hypertension situation and they were taking medications accordingly. This indicates an evidence of inadequate diagnosis and treatment of hypertension in this community. Additionally, only a small group of individuals (20 out of 167) has self-reported their diagnosis of diabetes, which shows that diabetes might be underdiagnosed as well. Moreover, cigarette smoking, alcoholism and obesity were all prevalent among homeless individuals, which imposes additional risk factors for cardiovascular disease in general. We should also bear in mind that financial and social assistance play a major role in decreasing the prevalence of hypertension in this population as our results indicate. Overall, Hypertension is prevalent among the Orlando homeless metropolitan community, which surpasses the national average. This observation might be attributed to high prevalence of main cardiovascular risk factors such as smoking and drug abuse among homeless individuals, in addition to hurdles to overcome those factors [16,17]. Furthermore, the diet of homeless individuals is usually high in saturated fats and

insufficient in essential nutrients, which leads to abnormalities in their lipid panel [7,18]. The study shows that social and financial services seem to lower hypertension prevalence among homeless individuals receiving the benefits. The study supports data from other countries offering affordable and accessible health care services. Specifically, our study provides a trend like data reported in Canada where hypertension prevalence was found to be only 35% among homeless population in the city of Toronto [19]. Canada provides affordable and accessible health care services to all residents including homeless individuals. We strongly believe that the prevalence of hypertension is much higher in other major cities especially those with harsher climate conditions. We plan to do a larger scale study on homeless communities residing in other major metropolitan cities and during different times of the year. Our study renews the call for more resources to help the homeless communities including development of more intervention programs to reduce smoking, and alcohol and substance abuse.

## Significance for Public Health

Hypertension is found to be prevalent among Orlando homeless community and it has exceeded the national average in the United States. Additionally, social and financial aids seem to decrease the prevalence of hypertension among homeless individuals receiving these benefits. The outcome of the study supports data from other countries offering affordable and accessible health care services, and certainly, it renews the call for more resources to help the homeless communities.

## Acknowledgement

Sincere thank you to our team volunteers including Ahmad Odeh, Abdel-Rahman N. Naser, Abed El-Rahman S. Naser, Sarah Abdelhameed, James Overman, Anupa Thirmiya, Elizabeth Aguilar,



Kayla Ferro, Ranya Awad, Corrine Haeberlin, Adrian Doddson, Iman Squires, Heather Issa, Theodora Meza, Bobak Manesh, and Elena Pham. Our thanks are also due to all the participants in our study and to the volunteers led by Chris Wilson at St. George Orthodox Church, Orlando, Florida.

### Competing Interest

The authors declare that they have no competing interests.

### Funding Sources

This study was supported, in part, by the Hearts for the Homeless project.

Availability of Data Materials: The datasets supporting the conclusions of this article are included within the article.

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ISSN: 2574-1241

DOI: 10.26717/BJSTR.2020.24.004099

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