Prevalence and Possible Risk Factors of Hypertension in Harmons, Jamaica

DE McGonigal, AL Way

ABSTRACT

Objective: To determine the prevalence and possible risk factors of hypertension in the rural community of Harmons, Manchester, Jamaica.

Methods: The present study was conducted in Harmons over the span of one week. Community wide blood pressure measurements and health history data were recorded by an investigational team. Basic anthropometric data were also collected. Statistical and descriptive analyses were performed on collected data.

Results: The sample size was 99 subjects. Ages of subjects ranged from 19 to 85, the greatest proportion being younger than 45. Individuals under the age of 18 were not permitted to participate in the study. A significant number of individuals reported immediate family history of hypertension and/or diabetes. Weak correlation was found between age and blood pressure. Correlation was also found between personal hypertension history and blood pressure. The prevalence of hypertension based on current American Heart Association blood pressure guidelines was 62.2%.

Conclusion: This research serves as a preliminary understanding of hypertension in Harmons. Subjects of importance for future study may include level of health education, social factors in determining care seeking and further study of hypertension and its risk factors.

Keywords: Access to healthcare, health disparities, health education, hypertension

---

From: Department of Health and Science, Lock Haven University of Pennsylvania, Lock Haven, Pennsylvania, United States of America.

Correspondence: Dr AL Way, Professor, Department of Health and Science, Lock Haven University of Pennsylvania, 44 Founders Hall, Clearfield Campus, 201 University Drive, Clearfield, PA 16830. Email: away1@lockhaven.edu

INTRODUCTION

Harmons, Jamaica is an underserved rural community located in the parish of Manchester in South Central Jamaica. The population of the community is around 2000 individuals. Harmons Valley has been served by Lock Haven University (LHU) for several years. Long-lasting relationships have been formed between those at the university and those who live in the community. Each year the university participates in community outreach in Harmons, during which some blood pressure data has been gathered. However, those who have their blood pressure measured elect to do so on their own, and may not make up a representative sample of those individuals who live in Harmons.

The present study was designed to evaluate the prevalence and possible risk factors of hypertension in Harmons. Currently, only limited data on this topic is available. Previous studies have been performed in other areas of Jamaica. Although there is data on a self-selected portion of the community, obtaining a more representative sample would provide more externally valid data on the true prevalence of hypertension in Harmons. It is important to note that rural communities, like Harmons, usually are not the subjects of epidemiological studies. As such, collecting blood pressure data on this population is an important preliminary step in identifying the major medical needs within this community.

SUBJECTS AND METHODS

A three-person investigational team was guided through Harmons Valley by two Jamaicans. Each of the several neighbourhoods within the community was visited over a three-day span. Houses were originally numbered using Google Earth Maps. However, due to development of the

area, satellite images were outdated and many houses were not present on the images. Bauxite mining in the area also led to field observations that did not reflect what was shown on satellite images.

This study was approved by the Lock Haven University Institutional Review Board (IRB) for the use of human subjects. After obtaining informed consent, individuals ages 18 and over were assessed in three standardized measures: height, weight and blood pressure.

Height: The subjects were standing upright against a wall, facing away from the wall. A tape measure was held against the wall, zero inches being level with the floor. A ruler was held parallel to the floor on top of the subject's head to obtain a height measurement. Measurements were made to the nearest fraction of an inch. The measurements were taken in inches and converted to meters.

Weight: The subjects were standing upright on a scale, on a level surface. The same scale was used for all subjects to ensure standardization. The measurements were taken in kilograms (kg). Body mass index (BMI) was also calculated from height and weight data using the formula BMI = weight (kg) / [height (m)] ^{2} (1). BMI values were categorized based on guidelines from the Centers for Disease Control and Prevention (CDC): Underweight (below 18.5), normal or healthy weight (18.5–24.9), overweight (25.0–29.9) and obese (30.0 and above).

Blood pressure: The subjects were sitting quietly with their arm at the level of the heart. First, the systolic blood pressure was estimated by palpation of the radial pulse. The radial artery was palpated with one hand while the cuff was inflated. The level at which the radial pulse disappeared was noted. The cuff was deflated and the subject sat at rest for approximately 30 seconds. Then the diaphragm of a stethoscope was placed lightly over the brachial artery while the cuff was inflated to a measurement 30 mmHg above the estimated systolic blood pressure. The cuff

was slowly deflated and the examiner noted the first and last Korotkoff sounds, these being the systolic and diastolic blood pressures, respectively.

It is important to note that clinical diagnoses of hypertension are recommended only if two or more encounters corroborate the finding. Due to the brevity of the trip to Harmons, this was not possible for the current study.

The subjects were also interviewed briefly about their health history using a standardized set of questions. Some questions used were based on risk factors known to be associated with hypertension according to the CDC (2). Other questions were based on issues known to be prevalent within the community (3).

Quality Control: Informed consent was obtained in the same fashion for all individuals. The informed consent form was approved by the LHU IRB. All members of the investigational team were trained in height/weight measurements and survey questions. All blood pressure measurements were recorded by the same individual.

The data were compiled into a spreadsheet to determine the prevalence and possible risk factors of hypertension in the community. Statistical analyses were focussed on mean, range and correlation coefficient (R^2) values. To study the relation between two variables, the variables were graphed in a scatter plot to compute a least squares line of best fit. Coefficients of correlation were computed from this line. The blood pressure of each adult patient was placed in one of the following categories based on current guidelines from the American Heart Association (AHA): Normal (less than 120 mmHg systolic and less than 80 mmHg diastolic), Elevated (120–129 mmHg systolic and less than 80 mmHg diastolic), Hypertension Stage 1 (130–139 mmHg systolic or 80–89 mmHg diastolic), Hypertension Stage 2 (140 mmHg or higher systolic, or 90 mmHg or higher diastolic), or Hypertensive Crisis [higher than 180 mmHg systolic or higher than 120 diastolic] (4). The blood

pressure measurements were also categorized based on the previous (prior to 2018) system for hypertension categorization for sake of comparison to previous studies.

For subjects with blood pressure readings within ranges from hypertension stage 1 to hypertensive crisis, follow-up instructions were given. There is a community health center available for use; pertinent literature (*ie* informational handouts with easily understandable language) was also available to subjects. During the week of the trip, the subjects were referred for evaluation by the university team.

RESULTS

Data were collected from a sample size of 99 subjects, with 60.6% being female and 39.4% being male. Ages ranged from 19 years to 85 years, with the highest proportion of respondents being in the 18–44 age group (Table 1). The mean age of subjects was 46.1 years.

Table 1: Age distribution of subjects

Characteristic	
Mean	46.1
Range	19 to 85
18-44	52.5%
45-64	28.3%
65-74	7.1%
>75	12.1%

Height measurements ranged from 1.49 to 1.96 meters among all subjects. The average height recorded was 1.68 meters. Weight measurements had a range of 42–130 kilograms, the average weight being 68.3 kilograms. Furthermore, subjects had BMI ranging from 15.8 to 50.2. The greatest proportion of subjects fell within the normal BMI range, but a significant number (26.2%) of individuals were also categorized as overweight (Table 2).

Table 2: Anthropometric data of subjects

Characteristic	Mean	Range	Underweight	Normal	Overweight	Obese
Height (m)	1.68	1.49-1.96				
Weight (kg)	63.8	42-130				
BMI	23.8	15.8-50.2	20.0%	44.6%	26.2%	9.2%

BMI; Body mass index

Based on the current (2018) hypertension guidelines, the prevalence of hypertension of the sample was 62.2%. Previous hypertension guidelines (prior to 2018) showed 38.8% of the subjects had hypertension. The distribution of hypertension categorizations is shown in Table 3. The average systolic blood pressure of the sample was 133.2 mmHg, while the average diastolic pressure measured was 82.9 mmHg. Systolic blood pressure measurements ranged from 96–218 mmHg and diastolic measurements ranged from 62–130 mmHg.

About one-third (32.3%) of the sample reported daily medication use. Of those who reported taking medications, drugs reported included hypertension medication (33.3%), asthma medication (6.1%), diabetes medication (9.1%) and various others. Some individuals taking medication did not specify the type. Two individuals reported use of both hypertension and diabetes medications.

Table 3: Hypertension prevalence and categorization

Previous guidelines	
Prevalence	38.8%
Normal	20.4%
Prehypertension	40.8%
Hypertension stage 1	26.5%
Hypertension stage 2	7.2%
Hypertensive crisis	5.1%
Current guidelines	
Prevalence	62.2%
Normal	20.4%
Elevated	17.3%
Hypertension stage 1	23.5%
Hypertension stage 2	33.7%
Hypertensive crisis	5.1%

Additionally, 37.4% of subjects reported alcohol use ranging from once a month to once a day. Tobacco use was reported among 11.1% of subjects. Illicit drug use was comparable to tobacco use, also being reported by 11.1% of subjects.

A number of subjects (24.2%) reported having a history of diabetes. Most individuals (65.7%) reported an immediate family member with history of hypertension, while 38.4% of subjects reported a personal history of hypertension.

A weak positive correlation ($R^2 = 0.3059$) was found between systolic blood pressure and age (Figure). No such correlation was present for diastolic blood pressure. Personal hypertension history was weakly correlated with both systolic blood pressure ($R^2 = 0.2915$) and diastolic blood pressure ($R^2 = 0.2021$). Statistical comparison of blood pressure and all other health history markers revealed no association between variables ($R^2 < 0.2$). Of the 11 individuals who reported taking hypertension controlling medication, ten still had hypertensive level blood pressure measurements.

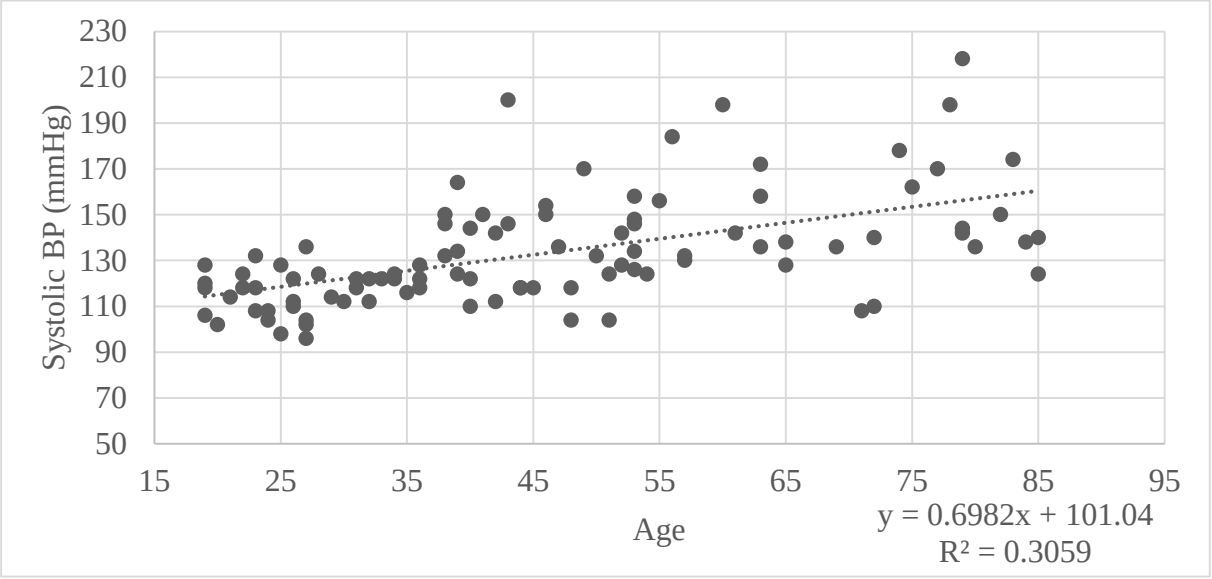

Figure: Systolic blood pressure as a function of age.

DISCUSSION

The data show that 62.2% of the sample is hypertensive based on the current blood pressure guidelines. It is possible that this high figure is derived from the fact that all the subjects were of African descent. It is well documented that individuals of African descent are at higher-risk for

developing hypertension (2). However, this is not the only possible explanation; a variety of other factors including medical history, behaviour and family medical history also influence the development of hypertension (2). Correlational data of this study demonstrates increased risk of hypertension as age increases in Harmons residents. Correlation was also found between personal hypertension history and hypertensive blood pressure readings. Future studies on this population could increase the sample size or improve correlational analysis to determine other risk factors of hypertension in Harmons.

Demographically, the sample was predominantly female (60.6%) and between the ages of 18 and 44 (52.5%). The sex ratio of the sample does not reflect the true ratio of Jamaica, which is 98 females to each 100 males (5). The age distribution of the sample is comparable to the true distribution of Jamaica, in which 38.2% of the population is between the ages of 25 and 54. However, as Jamaica's population ages, chronic diseases such as hypertension and diabetes will likely become more prevalent. As Eldemire-Shearer *et al* noted, investment in health and social service will become necessary to improve the quality of life for the aged in Jamaica (6). Walkabouts through the community during the week of the current study allowed for evaluation of those patients who were unable to leave their home. Future trips to Harmons will continue this trend as the population ages.

Health history data reveal issues prevalent in the community of Harmons. Many individuals reported a family history of hypertension and/or diabetes. A significant number of persons also reported daily medication use, namely antihypertensive medication. Hershey and Way reported that in 2016, many individuals requested future lessons on hypertension and diabetes (3). Future trips to Harmons hope to continue health education of the population regarding hypertension, diabetes and other health related topics.

The BMI distribution of the sample is comparable to the BMI distribution gathered by Hershey and Way in 2016. The sample size of this prior study was 95. This 2016 study reported 26.6% of the sample in Harmons as underweight, 34.7% as normal, 17.9% as overweight, 9.5% as obese and 11.6% unreported (3). The proportion of normal BMI individuals was higher in the current sample. The proportion of overweight individuals was also greater, while the proportion of underweight individuals was lower. This discrepancy could be due to differing sample characteristics or the fact that the prior study included persons under the age of 18. There is no national data on BMI in Jamaica available for comparison.

With respect to the previous blood pressure guidelines, the prevalence of hypertension of the sample was 38.8%. This number is comparable to Hershey and Way's figure of 42% hypertensive in 2016. Hershey and Way reported 31.9% prehypertensive, 21.7% hypertensive stage 1, 14.5% hypertensive stage 2 and 5.8% hypertensive crisis (3). The current study shows a higher proportion of individuals in the prehypertensive and hypertensive stage 1 categories, as well as a lower proportion of individuals in the hypertensive stage 2 category. Roughly the same proportion of individuals in the current study were categorized with hypertensive crisis as in the prior study.

A nationwide study of hypertension in Jamaica by Ragoobirsingh *et al* revealed the prevalence of hypertension among 2064 subjects to be 30.8% [based on previous hypertension categorization guidelines] (7). Health disparities between rural areas of Harmons and more populated areas could account for the 8% difference between the current study and the nationwide study. Ferguson *et al* described an increased risk in developing hypertension as predicted by occurrence of prehypertension in Spanish Town, Jamaica (8). A related study by Ferguson *et al* revealed the relationship between prehypertension and cardiovascular disease (CVD) in Jamaica. Those with prehypertension are at a higher-risk for CVD than those without it (9). As such,

informational literature was given to subjects with hypertensive or elevated blood pressure readings. Those with hypertension, chiefly those with hypertensive crisis type measurements, were given strong recommendation to see a physician.

It is also important to note that many individuals in Harmons do not seek treatment for hypertension whatsoever. It is possible that effects of stereotypical, masculine roles affected whether men would seek treatment. As Addis and Mahalik noted, men are generally less likely to seek professional help for mental and physical ailments (10). Additionally, not seeking treatment could be associated with the cost for traveling to and from a physician's office. It has been documented by Kusuma *et al* that socio-economic status plays a role in treatment seeking behaviour regarding hypertension (11) and Harmons is certainly socioeconomically disadvantaged.

Future considerations for making a lasting impact in Harmons include increasing health education and access to healthcare. The people of Harmons are more than willing to become educated about their health. However, disparities in education after primary school and socio-economic status often prevent individuals from accessing such information. One of the university's goals is to educate the people of Harmons on health-related topics of their choosing. Each year, students prepare informational literature on health issues written in easily understood language. During the trip, students are also available to community members for one-on-one lessons about health topics.

Subjects of importance for future study on this population may include level of health education, social factors in determining care seeking and further study of hypertension and its risk factors. Perhaps study of other important issues, such as diabetes and nutrition, would have merit. As with any population, future research in Harmons should be centered around providing the community with better access to healthcare and health education.

CONCLUSION

This research serves as a basis for future research and health related work in the rural community of Harmons, Jamaica. Noteworthy findings include a high prevalence of hypertension (62.2% based on current guidelines) and a weak positive correlation between systolic blood pressure and age ($R^2 = 0.3059$). The authors hope that the results of this study reveal the prevalence of hypertension in rural communities such as this one so that those who are affected can receive diagnosis and subsequent treatment.

ACKNOWLEDGEMENTS

The authors thank the study participants and investigational team (E Berkowitz, A Mehta, V Pham, T Price) for their contribution to the project. The authors also thank Professor Jennifer Bell for guidance on blood pressure measurement. Additional thanks to Professor Richard Burkett for advice on statistical analysis.

Author Contributions

DE McGonigal conceived paper, designed the study, performed data collection, analyzed data and wrote the manuscript. AL Way oversaw project design and data collection, critically evaluated manuscript and approved final version.

REFERENCES

1. Centers for Disease Control and Prevention. About Adult BMI. [Internet]. Atlanta, GA: The Association; 2017 [rev. 29 Aug 2017; cited 17 Oct 2017]. Available from: https://www.cdc.gov/healthyweight/assessing/bmi/adult_bmi/index.html
2. Centers for Disease Control and Prevention. High blood pressure risk factors. [Internet]. Atlanta, GA: The Association; 2014 [rev. 7 Jul 2014; cited 23 Dec 2017]. Available from: https://www.cdc.gov/bloodpressure/risk_factors.htm
3. Hershey RM, Way AL. A preliminary understanding of healthcare needs in rural Jamaica. Keystone Journal of Undergraduate Research 2017; **4:** 16–21.
4. American Heart Association. Understanding Blood Pressure Readings. [Internet]. Dallas, TX: The Association; 2017 [rev. Nov 2017; cited 2 April 2018]. Available from: http://www.heart.org/HEARTORG/Conditions/HighBloodPressure/AboutHighBloodPres%20sure/Understanding-Blood-Pressure-Readings_UCM_301764_Article.jsp#.Weesk2hSyUl
5. Central Intelligence Agency. (2017). The World Factbook: Jamaica. [Internet]. Langley, VA: The Association; [rev. 23 Mar 2018; cited 1 Apr 2018]. Available from: https://www.cia.gov/library/publications/the-world-factbook/geos/jm.html
6. Eldemire-Shearer D, Mitchell-Fearon K, Laws H, Waldron N, James K, Holder-Nevins DL. Ageing of Jamaica's population – what are the implications for healthcare? West Indian Med J 2014; **63:** 3–8.
7. Ragoobirsingh D, McGrowder D, Morrison E, Johnson P, Lewis-Fuller E, Fray J. The Jamaican Hypertension Prevalence Study. J Natl Med Assoc 2002; 94: 561-5.

8. Ferguson TS, Younger N, Tulloch-Reid MK, Lawrence-Wright MB, Forrester TE, Cooper RS et. al. Progression from prehypertension to hypertension in a Jamaican cohort: incident hypertension and its predictors. West Indian Med J 2010; **59:** 486–93.
9. Ferguson TS, Younger N, Tulloch-Reid MK, Lawrence-Wright MB, Ward E, Ashley D et. al. Prevalence of prehypertension and its relationship to risk factors for cardiovascular disease in Jamaica: analysis from a cross-sectional survey. BMC Cardiovasc Disord 2008; **8:** 1-9.
10. Addis M, Mahalik J. Men, masculinity, and the contexts of help seeking. Am Psychol 2003; **58:** 5-14.
11. Kusuma YS, Gupta SK, Pandav CS. Treatment seeking behavior in hypertension: factors associated with awareness and medication among socioeconomically disadvantaged migrants in Delhi, India. Coll Anthropol 2013; **37:** 717–22.