RESEARCH ARTICLE

Health Education and Mindfulness for Homeless Persons Diagnosed with Hypertension, Diabetes Mellitus and/or Obesity

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Abstract

Background

There has been a national increase in homelessness since COVID-19, despite federal, state, and local efforts to end homelessness, accompanied by an increase in chronic diseases such as hypertension (HTN), diabetes mellitus (DM), obesity, and other stress related conditions. The cost of goods, services, housing, healthy foods, medicine, and medical supplies have faced an inflationary squeeze, further increasing the homeless population and decreased access to health resources. Research has shown that chronic medical conditions worsened by stress are major risk factors for myocardial infarctions, stroke, and kidney failure.

Researchers consisting of physicians, nurse practitioners, and medical students conducted a face-to-face pilot study in one local homeless shelter over a 4-week period that showed high rates of HTN, DM, obesity, and overall stress among the sheltered residents. Researchers performed similar work using a virtual platform during COVID-19 Pandemic with a group of sheltered homeless residents. The virtual HTN, DM, and obesity education program showed an increase in knowledge of chronic diseases and improvements in blood pressure, blood glucose, and weight management.

The purpose of this paper is to report the impact of a pilot health education and clinical intervention program for sheltered homeless residents to become knowledgeable and empowered to recognize signs and symptoms of worsening disease, expected effects of pharmacotherapy, weight management through diet and exercise, and to decrease levels of stress through mindfulness (meditation) training.

Significance

As seen in America, homeless and underserved populations in South Florida are faced with medically complex needs that are minimally met by onsite clinics and have increased in severity since COVID 19. Homeless persons have limited access to onsite clinics and hospital outpatient services, and due to limited resources when scheduling appointments, face longer wait timesthat lead to gaps in care, resulting in worsening of disease progression. Initial, follow up care, and recovery support are minimal and negatively impact homeless persons, resulting in a cost burden to the healthcare system.

Methods

Homeless residents identified with a co-morbid condition from a medical records' review were invited to participate in the pilot study and to sign a consent agreeing to participate. Persons agreeing to participate were provided weekly one-hour health education, aerobic exercises, and mindfulness (meditation) sessions. Weekly blood pressure (BP), blood glucose (BG), and weight measurements were collected from participants. Thirty-minute aerobic exercises were performed by participants following each lecture series. A pre- and post-test was given at the start of the Pilot program and at the end of the fourth week to determine knowledge of diseases and prescribed medications, importance of exercise, proper dietary adherence, and levels of stress precipitating depression.

Interventions

Sheltered residents were provided with weekly 20-minute lecture series on HTN, DM, nutrition, exercise, and mindfulness. Individual medications have been reviewed with each participant for adherence and patient response. Those participants identified with additional medical concerns were accompanied tothe clinic for a medical encounter with a provider.

Results

Data were collected utilizing the mood questionnaire, BP measures, weight, BMI, and BG for each week the individuals participated in the project. Data was analyzed using sample paired t test and the repeated measure ANOVA based on data completeness; analyses were conducted on the data generated by the participants. SPSS Statistics V. 28.0 was used for data analysis. Descriptive statistics, correlation and group comparison analyses were conducted to answer the research questions; the sample was described using descriptive statistics, while histograms and the Kolmogorov-Smirnov statistic tests were used to assess the distribution of systolic, diastolic, BMI, and mood variables.

BP percent changes were calculated for the sample for each week after week 1. Overall, the BP measures were as follow for each week consecutively, Systolic/Diastolic (M= 130.86/83.86, SD= 20.03/12.07), (M= 126.64.0/83.36, SD= 7.05/7.06), (M= 126.0/86.78, SD= 20.4/12.14), (M= 128.31/83.69, SD= 16.59/9.22).BMI and weight measurements over the 4-week period showed a slight decrease from baseline. Participants mean weight at the beginning of the Pilot study was 220.9 and at the end of the Pilot study, the mean weight was 218.43. There were also minimal changes in the BMI showing pre-BMI 34.9 and post-BMI 34.7. The questions given to the participants on knowledge of hypertension, diabetes, and nutrition and weight are under review because majority of participants demonstrated difficulties in health literacy when completing the surveys and many questions were left blank, creating an intervening variable impacting the reliability of the results. The results of the questionnaires are being analyzed and rescreened for health literacy measures.

Conclusion

This pilot study demonstrated that effective lifestyle changes supported by weekly health educational programs, dietary adjustments, and pharmacological management, can have a positive impact on HTN, DM, obesity, and stress management among sheltered homeless persons. A reevaluation of written surveys are being analyzed improved health literacy. An extended approach to this program can lead to a decrease in the incidence and burden of chronic diseases among sheltered homeless persons.

Keywords: Homeless, Mindfulness, Hypertension, Diabetes, Obesity, Aerobic Exercise

Introduction

There has been a national increase in homelessness since COVID-19, accompanied by an increase in chronic diseases such as hypertension (HTN), diabetes mellitus (DM), obesity, and other stress related conditions.[1,2] Homelessness represents those persons who are unsheltered plus those staying in emergency or transitional housing.[3,4] Miami Dade County has the highest homeless rate in the State of Florida with upwards of 3,224 homeless persons in shelters and on the street on any given night (Table 1 Homeless Estimates in Florida and Table 3 Homeless Estimates in Miami Dade County-Single Year).[5] Lack of equity and access to care makes this group invisible and underserved.

Like the general population, there is a high prevalence of HTN and DM in the homeless population.[2] Due to a lack of access to quality care and existing multifactorial risk factors, the homeless population is suffering from chronic conditions 10-15 years earlier than the general population.[6] These conditions present usually at a more advanced stage and are poorly controlled at diagnosis.[2] Research has shown that chronic medical conditions worsened by stress, are major risk factors for myocardial infarctions, stroke, and kidney failure.[7]

The purpose of this paper is to report the impact of a pilot health education and clinical intervention program for sheltered homeless men to become knowledgeable and empowered to recognize signs and symptoms of worsening disease, expected effects of pharmacotherapy, weight management through diet and exercise, and to decrease levels of stress through mindfulness (meditation) training. The aim of this project is based on two Healthy People 2030 goals:

1) Housing and Homes that seek to "promote health and safe home environments" and
2) Healthcare Access and Quality that promotes "increase access to comprehensive high quality health care services" (Healthy People [HP] 2030).[8]

This pilot project and future research in this area is important because the cost of goods, services, housing, healthy foods, medicine, and medical supplies have faced an inflationary squeeze, further increasing the homeless population and decreased access to health resources.[9] According to a recent article in the Washington Post (July 2022), "inflation is making homelessness worse" with prices and rent increasing, the entire country is feeling the effects of poverty.[9]

In the past, the federal government conducted a mandated "point-in-time" unduplicated head count (reliable estimate) of the number of homeless people in each State on a given day in January.[10] During the COVID-19 Pandemic, it was difficult to determine the exact number of homeless persons across the nation, including Florida, due to multifactorial issues, such as

1) the increased number of emergency shelter closings,
2) limited numbers of volunteers to conduct the count,
3) adverse weather conditions,
4) COVID-19 restrictions, and
5) changes in federal guidelines on assessing shelter counts that aligned with the homeless housing inventory.

Shown in Table one (1) is the homeless estimate counts in twenty-eight (28) Florida counties that include Miami Dade County, recorded between 2012 and 2021, indicating a drastic decrease in 2021 from the previous nine years.[5,11]

However, in January 2022, the federally mandated "point-in-time" unduplicated head count provided greater accuracy as COVID-19 restrictions lessened and emergency shelters reopened to provide food and housing to the homeless. Florida reported an unduplicated head count increase in the total number of homeless persons in the state for the first time in ten years, showing 27,487 total homeless men, women, and children, 2,171 homeless households, 2,472 homeless veterans, and 1,450 homeless young adults. Florida's 2022.[11,12] There was also an increase in the number of homeless residents seeking housing at our local facility from about 75 immediate post-Covid-19 to approximately 200 residents.

According to the 2022 Florida Point-in-time Annual Report, males represented 63.71 % (16,446) compared to 35.97% (9,285) females; with transgender people at 0.16% (43) and gender nonconforming at 0.09% (22). In the ethnicity category, Non-Hispanic/ Non-Latinos represented 82.40% (21,270), and Hispanic/Latino at 17.60% (4,540). In the race category, Whites were the highest at 53.97% (13,930, Black or African Americans at 40.97% (10,575), and the other racial groups reporting less than 5% of the homeless population.[12] See Table two (2). 2022 Annual Report by Gender, Ethnicity, and Race. Similarly, men were the only enrollees at our south Florida facility, with the majority reporting non-Hispanic/ non-Latino Black or African American. A more concise report on the race and ethnicity of project participants is presented in the methods and results section.

Mindfulness was added because homelessness increases the allostatic load placed upon individuals.[13] By providing meditation prior to the start of the class with lights turned down, helps in the production of Melatonin, produced by the Pineal gland. Research has shown that the amount of light exposure controls the pineal gland which promotes sleep, enhances mood, and increases longevity.[14] Unfortunately, the number of homeless persons continue to increase despite federal, state, and local efforts to end homelessness for specific groups (races, ethnicities, or genders).[15] It is also unclear on the length of time that individuals or groups of people will be homeless. Some people will be homeless for a brief period and others for a lifetime, mostly dependent upon life's circumstances, economic and social influences, available housing, and available services (social and health) that promote stability. Persons who are identified as "chronically homeless" are those who have been homeless for longer than a year and have a disabling condition.[15,16]

A majority disabling condition seen among the homeless is resistant HTN or BPs that do not fall below 140/90 mm Hg, a key risk factor for stroke and heart disease, and the leading cause of death among Americans. Hypertension is estimated to cause approximately half of all cardiovascular mortality.[16] In 2020, HTN was listed as the primary cause of over 670,000 deaths in the United States.[17,18]

Table 1. Homeless Estimates in Florida

County	Homeless Estimate 2021 Count	2020 Count	2019 Count	2018 Count	2017 Count	2016 Count	2015 Count	2014 Count	2013 Count	2012 Count
Florida	21,141	27,679	28,590	29,717	32,109	33,502	35,964	41,335	43,455	54,972
Alachua	521	657	714	641	702	777	636	1,516	1,745	1,034
Baker	0	0	0	0	0	0	0	0	0	0
Bay	185	378	470	372	316	310	308	253	284	287
Bradford	12	0	4	33	6	0	0	0	50	36
Brevard	432	815	815	734	845	827	1,178	1,567	1,567	1,907
Broward	2,561	2,312	2,803	2,318	2,450	2,302	2,624	2,738	2,820	3,801
Calhoun	0	0	2	0	4	0	6	0	1	1
Charlotte	122	169	156	164	222	388	548	511	573	828
Citrus	221	171	262	169	175	224	180	188	243	507
Clay	57	74	74	62	84	76	147	102	35	244
Collier	568	603	498	653	621	545	389	361	375	390
Columbia	60	312	316	352	292	596	538	473	491	458
Miami-Dade	3,224	3,472	3,472	3,516	3,721	4,235	4,152	4,156	3,734	3,817
DeSoto	0	104	104	104	178	270	333	340	330	176
Dixie	0	0	0	0	0	0	0	0	0	0
Duval	1,137	1,494	1,494	1,640	1,643	1,784	1,566	1,801	2,594	2,533
Escambia	770	504	504	598	693	745	884	862	830	572
Flagler	37	73	130	62	75	104	105	188	154	128
Franklin	0	0	0	0	0	4	23	0	0	0
Gadsden	8	14	2	6	25	42	9	0	0	0
Gilchrist	0	0	0	0	1	0	0	0	0	32
Glades	0	34	34	36	44	85	96	96	0	0
Gulf	0	2	4	2	0	0	0	2	0	0
Hamilton	0	45	45	0	44	114	114	102	107	103
Hardee	0	70	70	82	81	96	124	124	61	17
Hendry	0	45	45	45	61	107	138	138	0	0
Hernando	169	151	151	182	189	143	218	77	147	209

Florida Department of Children and Families, 2022

Table 2. Annual Report by Gender, Ethnicity and Race 2022

Gender	2022 Number	2022 Percentage
Female	9,285	35.9%
Male	16.446	63.71%
Transgender	43	0.16%
Gender Nonconforming	22	0.09%
Ethnicity		
Hispanic/Latino	4,540	17.60%
Non-Hispanic/Non-Latino	21,270	82.40%
Race		
American Indian or Alaska Native	243	0.94%
Asian	103	0.39%
Black or African American	10,575	40.9%
Multiple Races	814	3.26%
Native Hawaiian/Pacific Islander	145	0.56%
White	13,930	53.97%

Florida Health Charts

Abbreviations

HTN: hypertension
BP: blood pressure
BG: blood glucose
DM: diabetes mellitus
SBP: systolic blood pressure

Another disabling condition is DM which causes deleterious effects on the renal system, resulting from deficient insulin activity that leads to progressive deterioration in kidney function to renal failure. Reports show that diabetic kidney disease can develop at a higher rate (approximately 40%) in patients diagnosed with DM and "is the leading cause of chronic kidney disease worldwide".[19] However, most diabetic patients die from cardiovascular diseases and infections. According to Bishop (2000), Kidney function decline can usually be seen in less than 20 years from the initial diagnosis in Type 1 diabetes and to a lesser degree in Type 2 diabetes as a direct result of a hyperglycemic environment constantly perfusing the vascular system. (p. 456).[20] Therefore, people who have been homeless a long time and have disabling conditions tend to be the most frequent utilizers of community emergency services and costly community resources. Many are also among the most medically vulnerable people who are homeless due to the serious medical conditions presented.[3]

Background

This project focused on providing measurable and sustainable interventions to a sheltered homeless population in south Florida with multiple co-morbid and treatable health conditions. Mindfulness was added to assist the residents in learning ways to address increasing levels of stress. The project also followed a previous research study conducted by the lead researcher during the COVID-19 pandemic, when homeless shelters were stricken with multiple residents contracting COVID-19 and several dying from the disease.[21,22]

A funded virtual health education program was conducted jointly by the Caring Place (Free) Clinic and the Homeless Shelter during the COVID-19 pandemic over an eight-month period. The project showed success in increasing patient awareness of their health conditions, improved outcomes in blood pressure, weight, and diabetes mellitus plasma glucose levels. Since the full reopening of homeless shelters, the need to educate new residents on managing their diseases and stress levels was apparent. The Caring Place Clinic approved the initiation of the pilot project that involved establishing an interdisciplinary team which included physicians, nurse practitioners, medical students/residents, post-licensure registered nurse students, dietitian, and an exercise physiologist to provide health education and health screenings (BP, DM, weight, and stress levels) on homeless residents residing at the Caring Place Center.

Studies have documented that homeless populations experience poorer health outcomes than the general population.[2,6] There is a present need for sustainable intervention strategies to prevent and manage chronic diseases in this population. The key to the design of an effective intervention aimed at preventing and curbing chronic diseases, specifically DM, HTN, and obesity, involves addressing risk factors and challenges faced by homeless population.

This pilot study is a beginning effort to address these issues. Project researchers postulate that health education, clinical interventions, mindfulness practice, and exercise will change health behavior and attitude as measured by BP, BG, and BMI which will lead to self-empowerment demonstrated by improved disease management and disease prevention. The selected homeless shelters provide eight-week, full-service programs, with an average stay of sixty days, along with onsite clinics that provide routine screenings and non-urgent medical care. In addition, the homeless shelters provide over 40,000 hours of counseling to the sheltered homeless to help bring about positive change in their lives. By providing homeless persons with secure housing, healthy foods, and access to health care, there is a decrease in stress, risk of disease, and mental health problems.

Significance of the Project

Miami Dade County has the highest homeless rate in the State of Florida with upwards of 3,224 homeless persons in shelters and on the street on any given night (Table 1. Homeless Estimates in Florida and Table 3 Homeless Estimates in Miami Dade County-Single Year).[5,11]

Earlier age of onset of chronic conditions in this population are attributed in part to the high burden of psychological stress or allostatic load. Allostatic load refers to the cumulative burden of stress and the physiological adaptations that must occur to overcome or adapt to stress; that includes increases in cortisol and epinephrine levels, cardiovascular reactivity, inflammatory and immune mediators, and metabolic and hormonal activation.[13] However, when the stressor becomes chronic as seen in homeless populations, there is dysregulation of body systems resulting in pathophysiologic alterations that contribute to increased risk of disease and dysfunction.[22]

Various chronic stressors have been identified in the homeless population, with the most obvious being lack of housing. Additionally, the experience of homelessness is usually accompanied by loss of social support which can have protective effects against stress.[23]

These stressors contribute to a state of chronic long-term stress, becomes maladaptive, and can lead to

Table 3. Homeless Estimates in Miami Dade County – Single Year
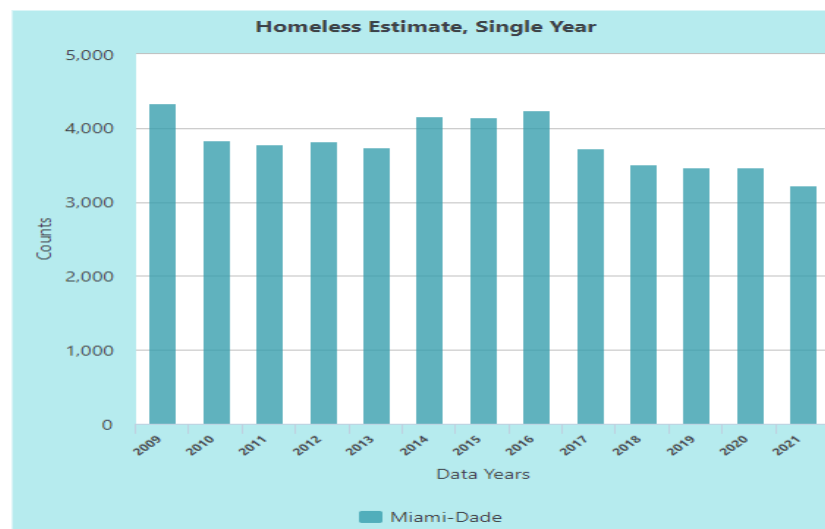
Florida Health Charts

decreased immune function, inflammation, and higher propensity for alcohol and drug use, all of which predispose someone to a diagnosis of HTN, DM and obesity.[22,23]

There is an increased interest in mindfulness-based interventions (MBI) on physical disease. While there are few studies currently that find direct impact on physical disease symptoms because of MBI, preliminary results show that MBI can modestly reduce objective markers of chronic disease such as blood sugar, weight, and blood pressure along with pharmacological interventions.[24] Not only is stress a strong risk factor, but conditions in homeless shelters specifically are not conducive to mitigating nutritional risk factors. It has been well demonstrated that soup kitchens and shelters alike most often provide nutritionally imbalanced meals due to lack of resources.[21,23,24,25]

Meals provided are usually contrary to "heart healthy" diets- being high in added sugars, sodium, and fat. Newer interventions are revealing that homeless shelters can provide an effective space to deliver information on nutrition and are well received by homeless populations.[25] Further research is needed to determine whether utilization of homeless shelters as areas to deliver nutritional and health education can increase proper management of hypertension and related chronic diseases.

Both nutritional deficits and allostatic load place homeless persons at risk for complications of HTN, DM and obesity such as stroke, cardiovascular events, and early mortality. Proper management has been shown to be effective in reducing the incidence of stroke and other complications. However, homeless populations underutilize preventative care which leads to poor treatment compliance and worsening of chronic conditions.[26]

There are limited interventions in this population aimed at proper management and prevention of these chronic conditions. Currently, most studies aimed at DM management focus on education.[19,27] It has also been recognized that peer support is an important component in successful self-management and medication adherence of these conditions in this population. Multidisciplinary interventions are needed because of this multifaceted problem.

To summarize the background, HTN and DM are major risk factors for myocardial infarctions, stroke, and kidney failure. With proper lifestyle changes, dietary adjustments and pharmacological management, hypertension and diabetes can be controlled. Patients are required to be knowledgeable of the signs and symptoms of worsening of the disease and the signs and symptoms of adverse effects of pharmacotherapy.

Methods

A quasi-experimental design using a one-group Pretest-Posttest (O-X-O) was used in this Pilot project to examine the relationships among health education, exercise, and meditation on BP, BG, and weight management in sheltered homeless men. The "O" represents the observed measures (BP, BG,

and weight/BMI). The "X" represents the experimental treatment (health education, exercise, and mindfulness (meditations).

Sampling

The target population was accessible adult males between 18-years to 75-years of age, diagnosed with HTN, DM, or obesity. A non-probability convenience sample of homeless men residing at the Caring Place Center, were invited to participate in the four-week Pilot study conducted in the large recreation room which housed the Case Managers' offices. The HTN, DM, nutrition, weight management, and mindfulness project was initiated at the beginning of July 2022, after receiving written approval by the administration of the Caring Place Center and Caring Place Clinic to conduct a four-week pilot study. The Pilot Study involved establishing an interdisciplinary team which included physicians, nurse practitioners, medical students/residents, post-licensure registered nurse students, dietitians, and an exercise physiologist to provide health education, consultation, and health screenings (BP, DM, weight, and stress levels) to homeless persons residing at the Caring Place Center, meeting study requirements. Homeless residents identified with a co-morbid condition based upon medical records' review were invited to participate in the pilot study and to sign a consent agreeing to participate. Persons agreeing to participate were provided weekly one-hour health education, aerobic exercises, and mindfulness (meditation) sessions. Weekly BP, BG, and weight measurements were collected from participants. Thirty-minute aerobic exercises were performed by participants following each lecture series. A pre- and post-test was given at the start of the Pilot program and at the end of the fourth week to determine resident's knowledge of diseases and prescribed medications, importance of exercise, proper dietary adherence, and levels of stress precipitating depression.

Participants

Participants were residents of the Miami Rescue Mission-Caring Place Center for homeless men. The participants' ages ranged from 39 to 64, with a mean age of 56 years. The HTN, DM, nutrition, weight management, and mindfulness class was open to all residents of the shelter; but only participants with a diagnosis of either HTN, DM, or obesity was included. Persons not meeting the inclusion criteria was excluded from the study results. The number of participants attending the health education classes ranged from 8-18 persons per class, with a mean attendance rate of eleven (11) participants. Attendance was compulsory and each week there was an announcement made over the loudspeaker at the Caring Place Center notifying all participants that class was starting. A weekly sign-in sheet was provided to all participants at each encounter and used to monitor attendance.

Ethical Considerations and Requirements

All study participants consented to participating in the Pilot Study by signing a written consent that outlined study requirements and participant protection rights. Following the consent agreement, participants were asked to complete four pre- and four post test questionnaires. The first three-questionnaires consisted of 5-questions each on knowledge of HTN, DM, and nutrition/ weight. The fourth questionnaire consisted of nine questions related to stress and coping. Findings of the questionnaires are in the results section. For participants with low literacy and/or language barriers, verbal instructions have been provided in their preferred language with 1:1 assistance offered by the researchers and project director.

Interventions

The Pilot Study was carried out using a quasi-experimental pre-post design with no control group. The intervention included three components: meditation, health education, and exercise. Each intervention was conducted for approximately one hour, delivered once a week for 4 weeks. At the start of the intervention, baseline measurements were taken that included weight, BP, and BG measurements. BG via finger-stick method was only taken for individuals who had a diagnosis of DM.

Prior to beginning each class session, BP, weight, and blood glucose evaluations were performed by medical students. Following the health screenings, attendees participated in a 3-5 min guided meditation video, with lights turned off, and eyes closed. Next, a medical student would deliver a 20-minute presentation on a topic related to HTN, DM, nutrition or obesity pathology and management. At the conclusion of the lecture, and questions and answer sessions, participants engaged in a 5-minute warm-up exercise session, followed by a more intense work-out session for 30-minutes, using a live personal trainer via Zoom and / or video-taped exercise sessions that included movement to music.

Most importantly, participants with poorly controlled measurements in BP and BG was escorted to the Caring Place Clinic for immediate follow up with a provider. In addition, medical students provided review of scheduled medications to determine duplications, outages, or for expired or incorrect medications. The researcher and medical students were available at the end of each session to address any additional health concerns presented by the participants.

Results

Data were collected as described in the methodology utilizing the mood questionnaire, BP measures, weight, BMI, and BG for each week the individuals participated in the project. Out of 16 individuals who were included in the project, 12 were included in the one-sample paired t test and the repeated measure ANOVA based on data completeness; analyses were carried out on the data generated by these 16 participants. SPSS Statistics V. 28.0 were used for data analysis. Descriptive statistics, correlation and group comparison analyses were conducted to answer the research questions; the sample was described using descriptive statistics, while histograms and the Kolmogorov-Smirnov statistic tests were used to assess the distribution of systolic, diastolic, BMI, and mood variables. To address whether the intervention captured the characteristics of the participants, correlation analyses were used to assess the relationships among the variables. The sample is composed of 69% African Americans (n= 11), 25% Hispanic (n= 4), and 6 % Caucasian (n= 1). BP measures were recorded, and a weekly average of systolic and diastolic BP measures were calculated. BP percent changes were also calculated for the sample for each week after week 1. Overall, the BP measures are as follow for each week consecutively, Systolic/Diastolic (M= 130.86/83.86, SD= 20.03/12.07), (M= 126.64.0/83.36, SD= 7.05/7.06), (M= 126.0/86.78, SD= 20.4/12.14), (M= 128.31/83.69, SD= 16.59/9.22).

Because group sizes were unequal during week one and week 4, variances were assumed to be heterogeneous. The overall week one BP measures compared to week four BP measures was statistically significant as measured by systolic and diastolic measures. The carried repeated measures ANOVA tests with a Greenhouse-Geisser correction determined that mean systolic and diastolic measures were statistically significantly different between time points, and from baseline at week 1 to post intervention during week 4 ($F_{(1, 25)}$ = 406.79, p< 0.001). Post hoc analysis with a Bonferroni adjustment revealed that systolic blood pressure (SBP) measures significantly decreased from pre-intervention to post intervention. It is noted that within group and between group differences were evaluated, as the variance in BP measures for this sample was high.

The purpose of this quasi-experimental design using a one-group Pretest-Post test was

1) to examine the relationships among health education, exercise, and meditation on BP, BG, and weight management in sheltered homeless men and

2) determine if an education and exercise intervention program improved health outcomes by lowering BP, normalizing BG, and decreasing weight over a 4-week period. Like a true experiment, a quasi-experimental design aims to establish a cause-and-effect relationship between the independent and dependent variable. However, unlike a true experiment, participants in this Pilot study were not randomly assigned, but were placed in the HTN, Diabetes, Mindfulness groups based on non-random criteria. The research questions were:
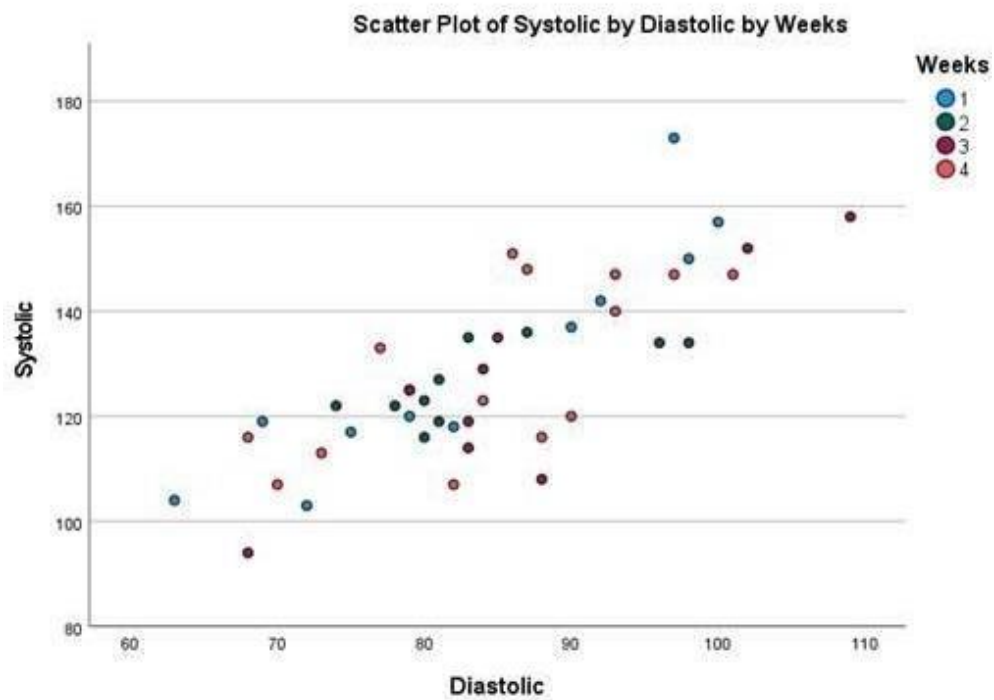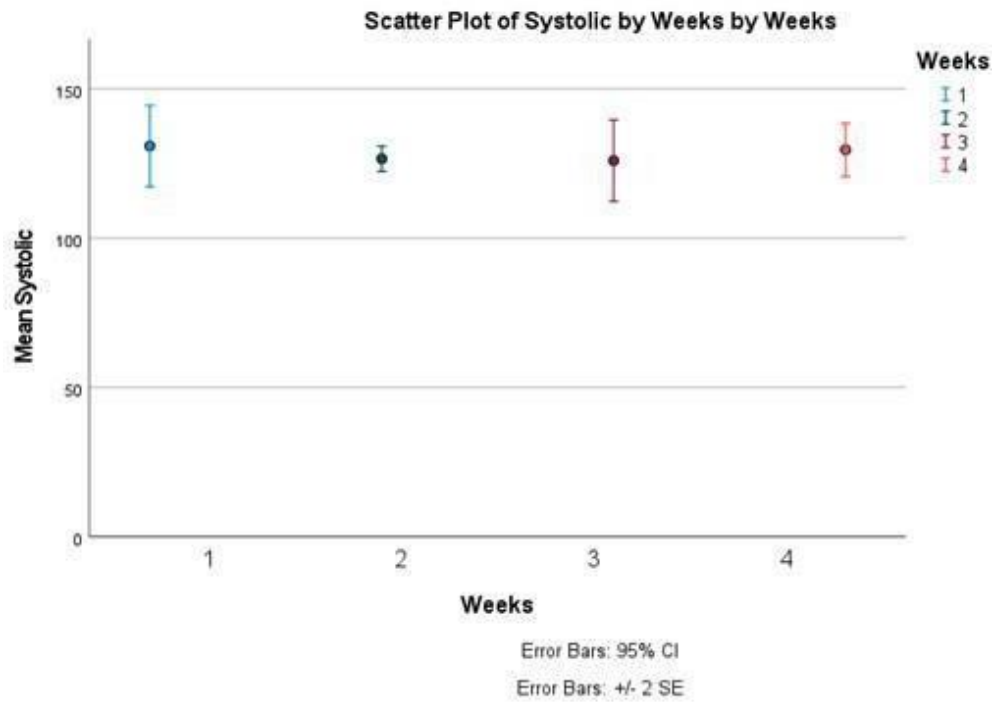
(1) are the mean differences between groups reflect true population differences or
(2) are the observed mean differences in the sample (treatment group) likely to have occurred by chance.

Blood Pressure Results

The SBP shows consistent correlation with diastolic measures, indicating that the measures taken are consistent with JNC-8 BP guidelines. The Pearson rho suggest the same (sys1, dia1, r= 0.914, p < 0.001; sys2, dia2, r= 0.709, p= 0.015; sys3, dia3, r= 0.878, p= 0.002, sys4, dia4, r= 0.689, p= 0.006). In the graphs with the error bars, note that there is more variability and uncertainty in the measures during week 1. Although during week four (4) some systolic and diastolic values seem to increase, this may have been caused by the higher variance during week one (1). This may also be consistent with individuals who reported being hypertensive (See Graph 1. Scatterplot of Weekly SBP and DBP Assessments; Graph 2. Scatter Plot of Systolic by Weeks by Weeks; Graph 3. Estimated Marginal Means of Systolic; Graph 4. Estimated Marginal Means of BP).

Table 4 shows the comparisons of weight and BMI measurements over the 4-week period. Participants mean weight at the beginning of the Pilot study was 220.9 and at the end of the Pilot study, the mean weight was 2218.43. There were minimal changes in the BMI showing pre-BMI 34.9 and post-BMI 34.7.

Table 5 through 8 provides the questions given to the participants on knowledge of HTN, DM and nutrition and weight. As stated, participants demonstrated difficulties in health literacy when completing the surveys and many questions were left blank. Similarly, participants had difficulty completing the Mood Screening Questionnaire, Table 7, without assistance, did not want to answer several of the questions, creating an intervening variable impacting the reliability of the results. The results of the questionnaires are being analyzed.
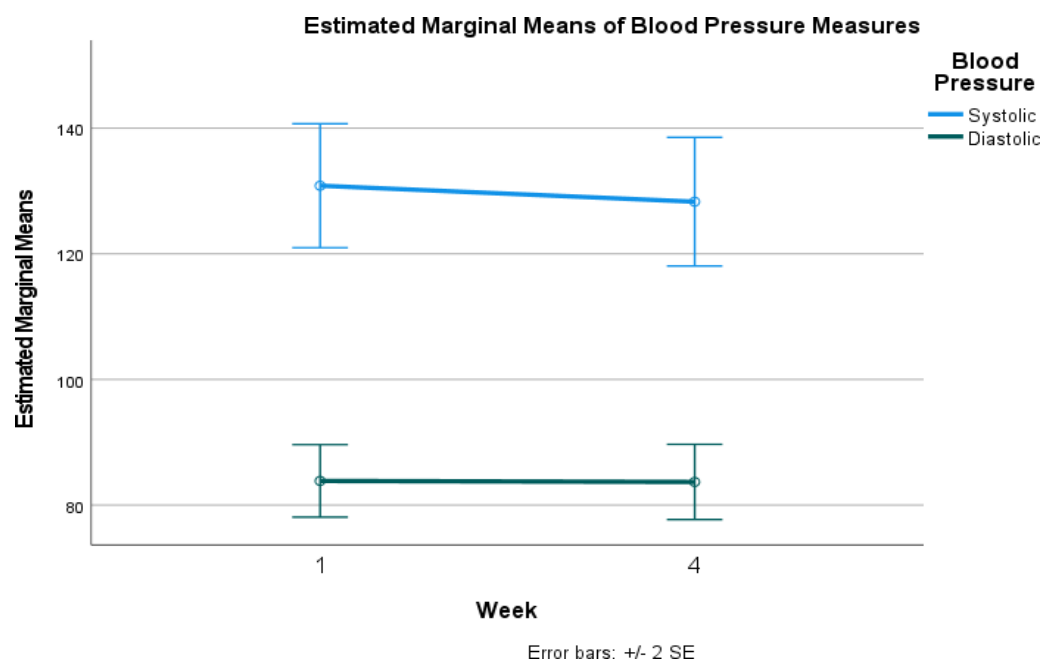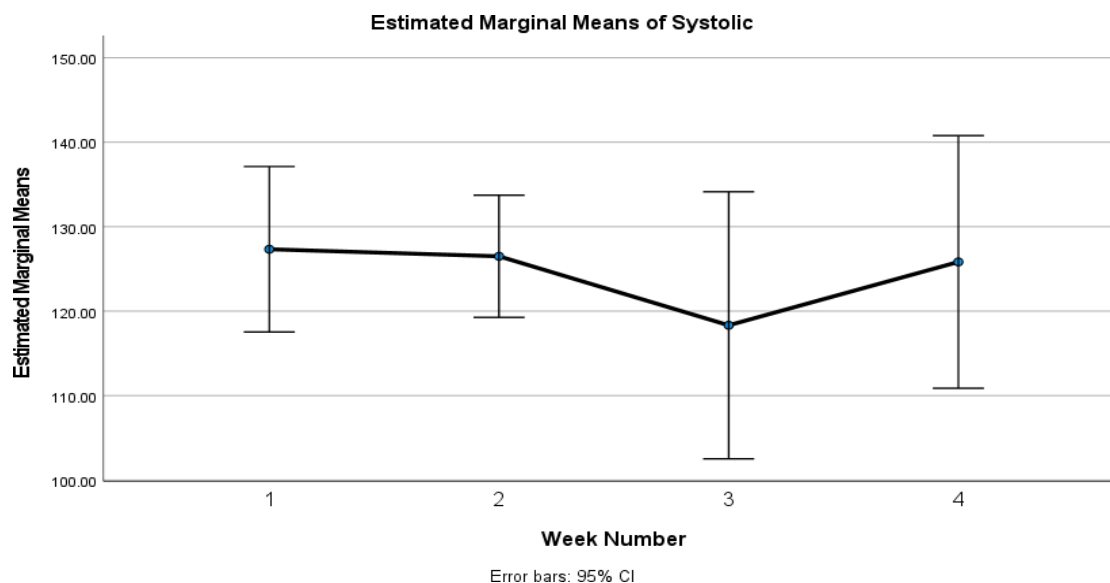
Scatter Plot of Systolic by Weeks by Weeks

Error Bars: 95% CI

Error Bars: +/- 2 SE

Scatter Plot of Systolic by Diastolic by Weeks

Estimated Marginal Means of Systolic

Error bars: 95% CI

Estimated Marginal Means of Blood Pressure Measures

Error bars: +/- 2 SE

Table 4. BMIs and Weight Comparisons

	N	X	Range	S_x	R	pV	X^2
BMI-Pre	8	34.9	23.2-59.9	10.05			
BMI-Post	8	34.7	22.6-59.8	9.99			
BMI-Pre BMI-Post					.998		
WT-Pre	8	220.9	135-278	49.19			
WT-Post	8	218.43	131.5-272	47.91			
WT-Pre WT-Post					.996		

Table 5. Hypertension Questions

Questions
High blood pressure is called "hypertension" which describes how hard blood pushes on the wall of veins and arteries as it moves around the body [T/F].
Being physically active can help reduce blood pressure [T/F]
What is a normal blood pressure reading?
When taking a blood pressure reading, how much room should be between the cuff and arm?
Which of the following could make my blood pressure high?

Table 6. Diabetes Mellitus Questions

Question
What is your understanding about diabetes?
Do you know how to use a blood glucose monitor? [Y/N]
Do you know what "hyperglycemia" or "hypoglycemia" means?[Y/N]
Diabetes is a condition that is a result of…
High blood sugar levels can cause…

Table 7. Nutrition and Weight Questions

Question
Losing weight may have which benefits for people with diabetes or high blood pressure?
Healthy eating for people with diabetes means…
The nutrient that has the greatest effect on blood sugar level is…
When grocery shopping, a person with diabetes or high blood pressure should…
Physical activity and exercise can…

Table 8. Mood Screening

Question	Responses
How have you felt in the last week?	Happy Motivated Calm Bored No interest Sad Depressed Unmotivated
In the past week have you felt unmotivated in doing everyday activities?	Never 2-days 4-days >6 days
In the past week have you felt down or hopeless?	Never 2-days 4-days >6 days
In the past week, have you had issues with falling sleep, staying asleep or constantly wanting to sleep?	Never 2-days 4-days >6 days
In the past week, have you had a change in your appetite?	Never 2-days

	4-days
	>6 days
In the past week, have you felt bad about yourself or that you have failed or that you have let your family or friends down?	Never
	2-days
	4-days
	>6 days
In the past week, have you had issues concentrating or completing tasks?	Never
	2-days
	4-days
	>6 days
In the past week, have you your peers noted that you are speaking or moving slowly or that you are more restless than usual?	Never
	2-days
	4-days
	>6 days
In the past week have you had thoughts of hurting yourself?	Yes
	No

Challenges, Recommendations, and Conclusion

Challenges

There were challenges and limitations to the pilot project. One major challenge was class attendance. Several residents had campus assignments that conflicted with the scheduled class times, interrupting continuity of educational interventions and measurements taken. Another challenge faced was medication adherence. A few residents did not renew their BP medications in a timely manner or as prescribed, resulting in elevated BPs and skewed results in BP readings. An associated limitation to missed medication was accessing the PCP or an appointment to obtain refills. The third challenge was healthcare literacy. Many of the residents were unable to read, understand, and correctly respond to the pre- and post-test questions, unless read to them by the researchers. There were two participants that required interpreters since the questionnaires were in English only. Another limitation involved the need for readers and interpreters for the questionnaires. To overcome the limitation, residents fluent in Creole and Spanish, along with the medical students provided interpretation to those participants facing language barriers.

Recommendations

The researchers identified five recommendations to address the challenges and limitations presented in the Pilot project. Attendance issues can be addressed by coordinating meeting times with the Case Managers or Center Director prior to beginning the educational interventions. Provide protected class time schedules to participating residents, excusing them from other shelter commitments during class. Incentives is another viable option to encourage active participation, exercise involvement, and medication adherence. Conduct prescreening weight and BP measurements a minimum of 15-minutes prior to the start of class, optimizing the educational and exercise sessions. The last recommendation involves the questions provided to participants.

(1) The number of clinical questions should not exceed five, except for the "Perceived Stress Scale."28
(2) Utilize a valid and reliable scale, the "Perceived Stress Scale"used to measure the perception of stress and captures the uncertainty faced by homeless persons.
(3) Provide questions in at least three languages, English, Spanish, and Creole.

Conclusion

There is a current need in ambulatory care for sustainable intervention strategies to prevent and manage chronic diseases in the homeless population and a health care challenge to increase sheltered patient awareness of their health conditions, improve outcomes in BP, weight, and DM (plasma glucose levels and hemoglobin a1c), and decrease stress levels associated with homelessness.

This pilot project intended to examine the relationship between health education, exercise, and mindfulness, and its effect on controlling BP and BG levels, and weight management among a group of sheltered homeless men. We also examined enabling factors, including having a primary care provider, transportation to health visits, and having competing priorities, or the concept that difficulty meeting basic survival needs may be a barrier to obtaining health care. The results were positive and demonstrated a need to

further this research with a larger cohort of homeless men and women if available and willing to participate.

Conflict of Interest

We have no conflict of interests to disclose and the manuscript has been read and approved by all named authors.

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