CLINICAL PRACTICE

Hypertension in Puerto Ricans in the Continental United States

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***Introduction*: Puerto Ricans comprise one of the largest growing minority groups in the United States, yet data about hypertension in this population is lacking.**

***Objective*: To review published literature concerning the epidemiology, morbidity, mortality, patient awareness, and treatment of hypertension in Puerto Ricans in the United States.**

***Literature Review*: The MEDLINE database was queried for English citations, dealing specifically with hypertension in Puerto Ricans. Most of the eligible studies were observational and qualitative in design and objectives.**

***Results*: Data about the prevalence of hypertension, attributable morbidity and mortality, and treatment of hypertension in Puerto Ricans in the United States were limited or not available.**

***Conclusions*: Studies about hypertension in Puerto Ricans are few. Most studies are observational and the rare clinical trials have major design flaws. Puerto Ricans with hypertension appear to have some common characteristics with other racial groups in the United States, but also have unique considerations in the epidemiology, perception and awareness of hypertension and the management and control of hypertension.**

Key words: Hypertension, Puerto Ricans, Health status, Morbidity, Mortality.

The Joint National Committee on Hypertension V (JNC V) (1) has estimated the prevalence and incidence of hypertension to be between 15 and 30% in the Continental United States. Limited data is published about medical conditions in the Hispanic community, including highly prevalent diseases like hypertension. Most studies on hypertension in Hispanics are done on Mexican-Americans (2-3) and very little data exists for other Hispanic subgroups.

Puerto Ricans comprise the second largest Hispanic group in the United States (4) with 75% living in three states: New York, New Jersey, and Connecticut. Studies about hypertension in Puerto Ricans would be valuable in understanding and managing hypertension in these patients. In this review article, we attempt to summarize the available medical literature that focuses on hypertension in Puerto Ricans.

Literature Review

A review of MEDLINE from 1966 to June 2005 was performed via OVID using the following MeSH terms: HYPERTENSION, HISPANIC AMERICANS, PUERTO RICO, HEALTH BEHAVIOR, ATTITUDE, HEALTH STATUS, PATIENT COMPLIANCE, and HEALTH SURVEYS AND NUTRITION SURVEYS. In addition, the following text words were combined with the above MeSH terms in order to fine tune the number of possible citations: LATINO$, LATINA$, PUERTO RICAN$, PUERTO RICO, PUERTO RIQUEN$, CULTURAL BELIEF$, VALIDATION TOOL$, and VALIDAT$. All MeSH terms were "exploded" and use of the Boolean operators "AND", "OR" and "NOT" were used when appropriate. Studies were limited to the English language.

Published studies, which involved "Hispanic patients", were individually assessed to determine the specific ethnic origin of these patients. Studies were eliminated if there was ambiguity of the Hispanic subgroup or subgroups that were being studied. The references of each eligible study, involving Puerto Rican participants, were also individually reviewed to look for additional relevant studies.

A total of 18 published papers were eligible for this review. Three studies were narrative reviews about hypertension in Hispanic subgroups. A single study involved a therapeutic clinical trial. The remaining thirteen studies were observational and descriptive (predominantly retrospective, cross-sectional studies) in design. Of the ten studies, one study reported exclusively on Puerto Rican patients. The remaining twelve studies involved Puerto Ricans and other Hispanic subgroups. Four of these studies did not specifically mention the exact composition of the various Hispanic subgroups, but involved Hispanics in New York City, where the predominant Hispanic subgroup is Puerto Rican. Table 1 summarizes the major characteristics of the studies.

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Table 1. Summary of Eligible Studies involving Puerto Ricans.

Authors	Study Title	Study Design	Relevant Study Population	Year of publication
C. Vergara, et al.	Awareness about factors that affect the management of hypertension in Puerto Ricans	Cross-sectional, single interviewer survey	19 hypertensive patients in Hartford, CT	2004
H. Lin, et al.	Hypertension among Hispanic elders of Caribbean origin in Massachusetts	Cross-sectional survey	77% (approximately 460 participants) Puerto Ricans in urban (Boston) Massachusetts	2002
C. Laffer,	Essential hypertension of Caribbean Hispanics: sodium, renin, and response to therapy	Randomized trial	117 participants in East Harlem New York. No stratification of patients into their specific country of origin	2001
J. Fang, et al.	The influence of maternal hypertension on low birth weight: differences among ethnic populations	Retrospective cross-sectional study	Hispanics in New York City but no specific stratification into. 294 Hispanics without specific stratification to country of origin	1999
T. Juarbe	Risk Factors for Cardiovascular Disease in Latina Women	Narrative review	Hispanic women, with specific mention to Puerto Rican women.	1998
Havas, et al.	Putting it all together: summary of the NHLBI Workshop on Hypertension in Hispanic Americans, Native Americans and Asian/Pacific Islander Populations	Narrative review	Hispanic Americans taken collectively	1996
C. Crespo, et al.	Hypertension and other cardiovascular disease risk factors among Mexican Americans, Cuban Americans and Puerto Ricans from HHANES	Cross-sectional survey: Hispanic Health and Nutrition Examination Survey (HHANES)	1330 Puerto Ricans	1996
MH. Alderman, et al.	Antihypertensive Drug Therapy. The effect of JNC criteria on prescribing patterns and patient status through the first year	Retrospective, cross-sectional review of medical records of patients seen in an outpatient primary care teaching environment	Hispanic Americans in New York City	1996
R. Gillum	Epidemiology of Stroke in Hispanic Americans.	Narrative review	Hispanic Americans	1995
C. Laffer	Suboptimal outcome of management of metabolic cardiovascular risk factors in Hispanic patients with essential hypertension	Retrospective, cross-sectional study	155 Hispanic patients in New York City without specific stratification into their specific country of origin	1995
S. Shea, et al.	Correlates of Non-adherence to hypertensive treatment in an inner-city population	Case-control interview	Hispanics in New York City but no specific stratification into. 84 Hispanics without specific stratification to country of origin	1992
S. Shea, et al.	Predisposing factors for severe, uncontrolled hypertension in an inner-city minority population	Case-control interview	Hispanics in New York City but no specific stratification into. 87 Hispanics without specific stratification to country of origin	1992
E. Ford, et al.	Test Characteristics of self-reported hypertension among the Hispanic population: findings from the Hispanic Health and Nutrition Survey	Cross-sectional survey: Hispanic Health and Nutrition Examination Survey (HHANES)	25% of the 9643 participants were Puerto Ricans	1990

Authors	Study Title	Study Design	Relevant Study Population	Year of publication
E. Barrios, et al.	Hypertension in the Hispanic and Black population of New York City	Cross-sectional Survey	145 participants in NYC. No stratification of patients into their respective country of origin	1987
G. Pappas, et al.	Hypertension prevalence and the status of awareness, treatment and control in the Hispanic Health and Nutrition Examination Survey (HHANES), 1982-84	Cross-sectional survey: Hispanic Health and Nutrition Examination Survey (HHANES)	495 Puerto Ricans living in NY, NJ, and CT	1990
A. Polednak	Mortality in the Hispanic population of Suffolk County, New York	Retrospective cross-sectional review of death certificates	"Hispanic" with predominant Puerto Rican subgroup, but no specified percentage of each subgroup	1990
P. Caralis	Hypertension in the Hispanic-American Population	Narrative Review with mention of preliminary results of a placebo-controlled trial	Hispanic Americans	1990
P. Sorlie, et al.	Mortality by Hispanic Status in the United States JAMA Nov 24, 1993;270:2464-2468 United States Senate Report. A report of the special committee on aging.	Longitudinal study recording mortality data	Also called the National Longitudinal Mortality Study, which involved 400,000 Hispanics (22,000 Puerto Ricans).	1986

Epidemiology

In 1982-84, the National Center for Health Statistics conducted the Hispanic Health and Nutrition Examination Survey (HHANES) in order to study trends in hypertension among the following three Hispanic subgroups; Mexican Americans, Cuban Americans and Puerto Ricans (5). The HHANES consisted of household interviews and physical examinations conducted by a bilingual interviewer in a mobile examination center. The average of two blood pressure measurements was obtained as the official blood pressure measurement. Systolic and diastolic blood pressures above 140 mm Hg and 90 mm Hg at the time of the interview were considered diagnostic cut-offs for hypertension. Use of anti-hypertensive medications also constituted eligibility for a diagnosis of hypertension. Approximately 78% (N= 1942) of eligible Puerto Ricans in the New York City area had agreed to participate in the survey. The Puerto Rican subgroup comprised 25% of a total of 7135 participants. The groups were felt to be representative of the true population that was surveyed, although women represented a larger proportion of the participants, especially in the Puerto Rican subgroup (i.e., 835 women versus 495 men).

The HHANES survey yielded the following results:

1) The prevalence of hypertension for Puerto Ricans, as well as for the other Hispanic sub-groups, increased with older age. Men had higher age-adjusted prevalence for hypertension than women.

2) The majority (approximately 78% of Puerto Rican men and 88% of the women) of the participants for all Hispanic subgroups had blood pressures in the normal range.

3) Those found to be hypertensive had mild diastolic blood pressure elevation, defined as a diastolic blood pressure between 90-104 mm Hg.

4) Puerto Ricans and the other Hispanic subgroups had a lower prevalence of hypertension and had lower blood pressure levels when compared to Blacks and Caucasians for all the age subgroups. Critics argue that these comparisons were not valid, since the Hispanic population of the HHANES, conducted from 1982-1984, were compared to the Black and Caucasian population of the NHANES II (6), which was conducted from 1976-1980. Critics of the HHANES also argue that the methodology of diagnosing hypertension for HHANES was flawed. The participants of the HHANES were given the diagnosis of hypertension after only several blood pressure readings in the same visit.

In a cross-sectional study (7) of 597 Hispanic elders of Caribbean origin (77% Puerto Ricans and 23% Dominicans) living in Massachusetts, systolic hypertension was similar between Hispanics and non-Hispanic Whites (14 -21% vs. 13%, not statistically significant). However,

after adjusting for potential confounders, Hispanics were 2.6 times more likely to have systolic hypertension than non-Hispanic White elders.

Hypertension Awareness and Control

The HHANES was designed to assess not only hypertension prevalence, but also hypertension awareness and control. The investigators of HHANES used the guidelines from the JNC V to reassess prevalence, awareness, treatment and control of hypertension.

Hispanic Americans were more likely to be aware of their hypertension than Caucasian hypertensives. Moreover, Hispanic women were more likely to be informed about their hypertension than Hispanic men. The specific prevalence of hypertension awareness of Puerto Rican, Cuban, and Mexican-American women were 96.1%, 95.1%, and 95.0%, respectively, while those for the Hispanic men were 78.7%, 87.2% and 67.9%, respectively. Moreover, Puerto Rican women were 44.5% more likely to be receiving treatment for their hypertension than Puerto Rican men, and about 30% more likely to have their blood pressure under control. However, from an absolute risk perspective, Puerto Rican women still exhibited poor control of their blood pressure, with just under 42% of the women classified as having controlled blood pressure. Puerto Rican men faired much worse, with an absolute percentage of 11.9% for those with controlled blood pressure. No long-term observational studies in Puerto Ricans have been done to accurately determine blood pressure control prevalence and it is unclear what factors are involved in creating the observed sex disparity.

A smaller observational study (8), done in the South Bronx of New York City, supported the findings of the HHANES. Study participants were identified as a result of a one-day health fair. Of the 145 participants, 63.8% of the Hispanic subgroup was Puerto Rican. About 74% of Hispanic participants stated that they knew about hypertension (e.g., 72.5% men and 75.4% women, respectively). Forty percent (40%) of the Hispanic participants admitted being hypertensive, yet over 75% of these hypertensives were not controlled (using 140/90 mm Hg as the hypertensive cut-off level) when the blood pressures were checked at the time of the fair. Unfortunately, about 49% of those Hispanics who stated that they did not have hypertension actually had elevated blood pressures at the time of the health fair. Whether or not these participants with elevated blood pressure were eventually diagnosed with hypertension at a later time is not known.

Ford, et al. (9) used data from the HHANES to determine the sensitivity, specificity, positive and negative predictive value of self-reported hypertension by a subset of approximately 5200 Hispanic patients from ages 18 to 74 years. Puerto Ricans had an overall sensitivity of 72% (i.e., Only 72 out of 100 participants who actually had the diagnosis of hypertension reported that they were aware of the diagnosis.) for self-reported hypertension compared with 71% and 56% for Cuban-Americans and Mexican-Americans, respectively. Sensitivity was greater for women, obese individuals, and those with access to a regular place of medical care. Sensitivity tended to increase with age but to decrease with the time interval from the last medical visit. Specificity of reported hypertension (82% for Puerto Ricans and 84% and 88% for Cuban-Americans and Mexican-Americans, respectively) was greater than sensitivity. The positive predictive value (PPV) of 39% for Puerto Ricans was the lowest among the three Hispanic subgroups. To state it another way, only 39% of those who indicated being hypertensive were actually hypertensive (true positives). Minimal criteria and clinical relevance for acceptable sensitivity, specificity, PPV and NPV (negative predictive value) for Puerto Ricans and other Hispanic subgroups is not known. Table 2 summarizes the main test characteristics for Puerto Ricans and the other Hispanic subgroups.

Table 2. Test characteristics for self-reported hypertension in Hispanic subgroups in the HHANES II 1982-84 (5).

Test characteristics	Puerto Ricans	Cuban-Americans	Mexican-Americans
Sensitivity	72	71	57
Specificity	82	84	88
PPV*	39	53	49
NPV**	95	92	91

*PPV = positive predictive value **NPV = negative predictive value

In 2004, we reported a small pilot study (10) on 19 patients, assessing self-reported awareness of factors related to hypertension, such as diet, exercise, smoking, and complications from hypertension. Although the study sample was small, the study emphasizes the importance of understanding how these factors may relate to compliance with hypertension management in Puerto Ricans. Larger powered studies are needed to draw more valid conclusions.

Mortality Data

Mortality data for Puerto Ricans residing in the United States are limited, since national mortality statistics have only recently included Hispanic status as a separate category from whites. Sorlie, et al (11) conducted National Longitudinal Mortality Statistics (NLMS), which recorded

mortality data for a cohort of approximately 400,000 that included about 22,000 Puerto Ricans (9000 men and 13,000 women) for 9 years. Although the NLMS reported the standardized mortality ratio (SMR) for cardiovascular disease for Puerto Ricans relative to non-Hispanics to be 0.65 (men) and 0.80 (women), mortality data due specifically to hypertension was not available.

A similar but smaller study (12) to the NLMS examined death certificates during 1979-1983 for Hispanics in Suffolk County, New York. The predominant Hispanic group in Suffolk County is Puerto Rican and other Caribbean Hispanics (e.g., Cubans and Dominicans). The investigators reported similar standardized mortality ratios to those observed in the NLMS for ischemic heart disease in Hispanics (0.66 and 0.70, respectively, for men and women), but mortality data specific for hypertension was not available. Both the Suffolk County study and the NLMS support the finding of lower mortality due to cardiovascular disease in Hispanics when compared to non-Hispanic whites. However, data released from the Puerto Rican Department of Health (13) suggest that the mortality rate due CHD and hypertensive heart disease is increasing, while the mortality rate for the same diseases in the United States are decreasing. Plausible explanations for this increasing trend in mortality rate may be related to any or all of the following: dietary changes, social stresses and increasing prevalence of diabetes and obesity.

Data on mortality statistics due to cerebrovascular disease in Puerto Ricans, as well as all other Hispanic subgroups, are scarce. A review article about the epidemiology of cerebrovascular disease in Hispanics examined data from the National Center for Health Statistics (14). Over 5% of all deaths in US Hispanics in 1990 were due to cerebrovascular disease compared with 6.90% for Caucasians. However, exclusion of improperly completed death certificates from New York for the three-year period of 1989 to 1991 have raised questions about the validity of these mortality statistics. Age-adjusted death rates due to cerebrovascular disease from 1986 to 1988 for Puerto Rican men and women were the highest among the major Hispanic subgroups (Table 3). This is an interesting finding since the age-adjusted death rates due to cerebrovascular disease for each of the major Hispanic subgroups were lower in the United States than in their respective countries of origin, except for Puerto Ricans. Two plausible explanations for this observed lowering of death rates in the US may in part be due (1) improved hypertension control and/or (2) elderly Hispanics may return to their countries of origin in order to live out the rest of their lives and eventually die there.

Table 3. Age-adjusted death rates due to cerebrovascular disease in Hispanic subgroups from 1986 to 1988 (14).

Subgroup	Men	Women
Puerto Ricans	49.2	41.3
Cuban-Americans	30.2	24.2
Mexican-Americans	21.7	22.6

Morbidity Data

Uncontrolled Hypertension (Hypertensive Urgency and Emergency)

Much of the morbidity of hypertension relates to the degree of control of the blood pressure level. A study by Shea, et al. (15) examined the relationship of uncontrolled hypertension to various factors pertaining to the medical care of an inner city, minority population. A significant percentage of this population included Caribbean Hispanics, although the authors did not provide numerical breakdown of the study patients into specific Hispanic subgroups. This retrospective case-control study involved approximately 200 patients, who presented to or were admitted from the emergency room with a diagnosis of uncontrolled hypertension. Eligible patients were interviewed with a standardized questionnaire. Analysis of the data using multiple-logistic regression models showed that severe, uncontrolled hypertension was more likely to occur in those patients with no primary care physician, those who did not comply with their hypertension treatment, and those without health insurance. The odds ratio for these risk factors were 3.5 (95% CI of 1.6 to 7.7), 1.9 (95% CI of 1.4 to 2.5) and 1.9 (95% CI of .8 to 4.6), respectively. Moreover, these patients were more likely to receive their antihypertensive medications and blood pressure checked in emergency rooms rather than in outpatient clinics or offices. The odds ratio suggests that lack of a primary care physician is the strongest predictor of uncontrolled hypertension.

Shea, et al. continued their work examining the correlates of adherence and non-adherence to hypertension treatment (16). With multiple logistic-regression analysis, non-adherence correlated with having blood pressure checked in the emergency room, lack of primary care provider, current smoking and younger age (see Table 4 for respective odds ratio and confidence intervals). The observational design of these studies precludes causal inferences. Purported factors that may influence adherence to hypertensive treatment include provider-patient relationship and communication, cost of treatment, hypertension awareness, side effects of treatment, medical insurance status, education level, access to health care system and other psychosocial issues.

Table 4. Adjusted Odds Ratio for Clinical Variables as Correlates to Nonadherence to Antihypertensive Therapy (16).

Clinical Variable	Odds Ratio	95% Confidence Interval
Blood pressure checked in emergency room	7.9	1.75 to 35.77
Lack of primary care physician	2.9	1.37 to 6.02
Current smoking	2.4	1.10 to 5.22
Younger age	1.03	1.00 to 1.06

Cardiovascular Disease

A review (17) about cardiovascular disease in Latina women reported higher age-adjusted death rates in women born in Puerto Rico compared to those for women born in Mexico or Cuba. However, HHANES data report the lowest prevalence of hypertension in Puerto Rican women (11.5%) when compared to Mexican (14.1%) and Cuban (15.5%) women. All Hispanic subgroups; however, had lower prevalence rates of hypertension than Caucasian females. These findings suggest that although hypertension is less common among Puerto Rican women, death due to hypertension is higher for Puerto Rican women when compared to death rates for all other Hispanic groups and Caucasian women.

HHANES data also suggest small but significant prevalence rates for the combination of hypertension and other cardiovascular disease risk factors. For example, the prevalence rates for Puerto Rican men and women with both hypertension and smoking were 5.6% and 3.0%, respectively. Of note, Puerto Rican men and women had the highest rates of current smoking when compared to the other Hispanic subgroups. Review of the prevalence rates for those with both hypertension and hypercholesterolemia yielded rates of 6.3% and 7.2%, respectively, for men and women. HHANES data show higher serum cholesterol levels for Puerto Rican women than for Mexican and Cuban women. Further analysis of data from HHANES by Crespo, et al. (18) demonstrated a higher prevalence of obesity among hypertensives than among normotensives for both sexes and for all Hispanic subgroups. The prevalence rates of obesity in Puerto Rican women (men) with hypertension versus those women (men) without hypertension were 44% (39%) and 38% (24%), respectively.

The investigators go on to report that hypertension and other combined cardiovascular disease risk factors were more likely in women with less formal education. Whether the validity of this last finding is true, requires further study into the social, cultural, economic and other factors that impact the formal education of Puerto Ricans in the United States. The 1994 National Heart, Lung and Blood Institute (NHLBI) Workshop on "The Epidemiology of Hypertension in Hispanic Americans, Native Americans and Asian/Pacific Islander Americans" reported that "data were lacking on diet, physical activity and alcohol consumption" on Hispanic Americans and the other minority groups (19). The relationship among hypertension and other cardiovascular disease risk factors, such as obesity, diabetes mellitus and hyperlipidemia, or the so-called metabolic syndrome, has not been well established in Puerto Ricans.

A small retrospective study attempted to look at the management of these metabolic cardiovascular risk factors in Hispanic patients in New York City (20). Although the authors of this study did not specifically breakdown the study population into specific Hispanic subgroups, the study setting was at the general medical clinic of a major teaching institution, which serves a predominantly Puerto Rican population. Observational data demonstrated that many of the metabolic cardiovascular risk factors were suboptimally managed. For example, 39% of the patients had untreated blood pressures. Use of regression models allowed for the prediction of risks for coronary events. Interestingly, hypothetical correction of any of the other metabolic risk factors (e.g., diabetes, smoking, hyperlipidemia, etc.) was more powerful than correction of the blood pressure to 140/90 mm Hg. The observations seen in this study are certainly compelling and may not be unique to urban Puerto Ricans.

Pregnancy-related Complications

A single study attempted to study pregnancy-related outcomes of maternal hypertension in Hispanic women (21) in New York City. The study attempted to determine the influence of maternal hypertension on the incidence of low birth weight (defined as <2500 grams) neonates among Caucasian, African-Americans and Hispanics (a significant proportion consists of Puerto Ricans) in New York City. The investigators analyzed the birth certificates in NY City from 1988 to 1994. The low birth weight rate for Hispanics was intermediate to that of Caucasians and Africa-Americans (5.0%, 7.5% and 12.8%, respectively). However, Hispanic mothers were most likely to develop hypertension as a result of pregnancy and develop preeclampsia and eclampsia. A percentage of these mothers may actually have undiagnosed chronic hypertension and not really have new-onset pregnancy-related hypertension. Earlier detection of these women with undiagnosed hypertension may lead to a more proactive management of hypertension and minimize perinatal outcomes.

Treatment

Previous reports (1, 22-23) from the Joint National Committee (JNC) on Detection, Evaluation and Treatment of High Blood Pressure (i.e., JNC IV and V) have clearly stated that little information is known about the response to antihypertensive medications of various ethnic groups other than African Americans.

Studies on Puerto Ricans are rare and preliminary. Preliminary results of a double-blind, placebo controlled trial on hypertension in Hispanic-Americans (24) support the efficacy of thiazide diuretics, such as Dyazide. Because of the greater predisposition for Hispanics to develop insulin resistance, diabetes mellitus, dyslipidemia and syndrome X, the National High Blood Pressure Education Program Working Group recommends institution of the lowest possible dose of thiazide diuretics or beta-blockers as first line therapy for the treatment of hypertension (25).

In an observational study (26) looking at the effect of JNC guidelines on the prescribing patterns and blood pressure status of patients enrolled in a hypertension program in New York City, the authors reported that blood pressure control was no different in those Hispanics treated with diuretics and/or beta blockers than in those treated with ACE inhibitors and calcium channel blockers. The study involved a clinic population with a significant proportion of Hispanics (i.e., 30%-50%), most of which were Puerto Ricans. However, the study was observational in design and did not attempt to compare the efficacy of the various antihypertensive medications as an outcome objective.

Laffer and Elijovich (27) reported the only systematic trial on 89 hypertensive Hispanics of Caribbean origin. Seventy-nine percent (79%) of the participants were Puerto Ricans, and 80% were women who lived in the East Harlem section of New York City. The study aimed to assess the blood pressure response of Caribbean Hispanics to different classes of antihypertensive medications. Participants were randomized to receive placebo, hydrochorothiazide (HCTZ), calcium channel blockers (CABL), beta-blockers (BBLO), ACE inhibitors or fixed combinations of ACE inhibitors and HCTZ for 8-12 weeks. The results of the study suggested that CABL, HCTZ and ACE inhibitor/HCTZ combinations reduced blood pressure greater than placebo, but that monotherapy with BBLO and ACE inhibitors did not significantly reduce blood pressure. Unfortunately, the study contained many design flaws that precluded drawing any valid conclusion.

However, some noteworthy findings of the study were the demographic and laboratory observations made prior to the start of the study during the wash out period (Table 5). The participants had a high percentage of cardiovascular risk factors and hypertensive end-organ damage. For example, there was a high prevalence of obesity (BMI > 30 kg/m2), diabetes mellitus, hypertensive retinopathy and left ventricular hypertrophy. Twenty-four hour urine sodium excretion suggested that only 35% of the participants limited their sodium intake to 100 mEq/day, as recommended by the Joint National Committee on Hypertension. Plasma renin levels were lower for hypertensive Hispanics than for normotensive Hispanics. This suggests a similarity to African Americans with respect to low renin levels, response to salt restriction and response to various types of antihypertensive medications.

Table 5. Baseline Observations in Hypertensive Caribbean Hispanics (27).

Clinical observation	Percentage
Obesity	45%
Diabetes Mellitus	30%
Hypertensive retinopathy (grade I and II)	79%
LVH* by electrocardiogram	14%

*LVH = Left Ventricular Hypertrophy

Well-constructed clinical trials with larger sample sizes are clearly needed to study treatment responses and other therapeutic considerations in hypertensive Puerto Ricans and the Hispanic community overall.

Conclusion

In 1991, the overall health status of Puerto Ricans has been deemed to be the worst of the three major Hispanic subgroups (i.e., Puerto Ricans, Cuban-Americans and Mexican-Americans) by The Council on Scientific Affairs of the American Medical Association's Report on Hispanic Health (28). Currently, studies of hypertension in Puerto Ricans are lacking. All studies reported to date about hypertension in Puerto Ricans have been observational in design and limited to Puerto Ricans residing in large, urban cities in the Northeast. Puerto Ricans appear to have a lower prevalence of hypertension than Blacks and Caucasians, although the veracity of the true prevalence has been questioned due to criticism about the methodology of diagnosing hypertension in many of the aforementioned observational studies

Mortality data attributable to hypertension are not available for Puerto Ricans in the United States. Morbidity from hypertension has been reported with respect to the level of hypertension awareness, hypertensive urgency/emergency, cardiovascular disease, and preeclampsia. Puerto Ricans overall have poor awareness with respect to the control of their hypertension. Puerto Rican men appear

to have worse hypertension control than Puerto Rican women. Emergency room visits and hospital admissions related to uncontrolled hypertension (i.e., hypertensive urgency/emergency) may be related to poor adherence to hypertensive therapy and issues related to healthcare access. Surprisingly, cardiovascular morbidity appears to be worse for Puerto Rican women than Puerto Rican men. Concomitant cardiovascular risk factors, such as smoking, obesity, diabetes mellitus and hyperlipidemia, occur commonly in Puerto Rican hypertensives. Clinical trials of hypertensive therapy in Puerto Ricans are lacking and available studies have flawed methodology. Future studies are urgently needed in order to provide a better understanding of hypertension in Puerto Ricans.

Resumen

Los puertorriqueños constituyen uno de los grupos de minorías más grandes y crecientes en los Estados Unidos, pero aún hay escasez de información sobre la hipertensión en esta población. El objetivo de este artículo es revisar la literatura publicada con respecto a la epidemiología, morbosidad, mortalidad, conocimiento del paciente y tratamiento de la hipertensión en puertorriqueños que viven en los Estados Unidos. La base de datos de MEDLINE fue revisada, y se utilizaron artículos escritos en inglés que específicamente trataran con puertorriqueños. La mayoría de los estudios elegibles fueron observacionales y cualitativos en cuanto a diseño y objetivos, y como resultado esta revisión esta escrita en formato narrativo más bien que en revisión sistemática. La información sobre la prevalencia de la hipertensión, la morbilidad y la mortalidad atribuibles y el tratamiento de la hipertensión en los puertorriqueños que viven en los Estados Unidos fue limitada o no disponible. Hay pocos estudios disponibles sobre la hipertensión en puertorriqueños. La mayoría de los estudios son de observación y los escasos ensayos clínicos tienen imperfecciones graves en cuanto al diseño. Los puertorriqueños con hipertensión parecen tener algunas características en común con otros grupos raciales en los Estados Unidos, pero también parecen tener consideraciones únicas en cuanto a la epidemiología, la percepción y conocimiento de la hipertensión y el manejo y el control de la hipertensión. Se necesitan futuros estudios para validar estas observaciones.

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