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Hypertension among Rural Hispanics and Non-Hispanic Whites: The San Luis Valley Diabetes Study

SYNOPSIS

IN THE SAN LUIS VALLEY DIABETES STUDY (SLVDS) researchers studied hypertension morbidity and risk factors in 1788 Hispanics and non-Hispanic whites (NHW) from the rural San Luis Valley in Colorado. Hypertension was defined by *The Fifth Report of the Joint National Committee on Detection, Evaluation, and Treatment of High Blood Pressure (JNC-V)* criteria. In this population-based study, the prevalence, incidence, and risk factors for hypertension did not differ significantly between non-diabetic Hispanics and NHW participants. Hypertension risk increased with age, heart rate, serum triglycerides, insulin area, and obesity (in young participants). Compared with the prevalence rates in non-diabetic participants, the rates were significantly higher in people with diabetes and increased with the duration of diabetes and central obesity. The risk of hypertension in diabetic Hispanics appeared to be somewhat lower than that in NHW diabetics.

Compared to non-Hispanic white (NHW) populations, Hispanics in the southwestern United States appear to have similar or lower prevalence of hypertension (1-3) despite their relatively unfavorable patterns of obesity, central adiposity, and non-insulin-dependent diabetes. Less is known concerning the incidence of hypertension and its predictors, especially in Hispanics living in rural areas. Here we review pertinent data from the San Luis Valley Diabetes Study (SLVDS)—a population-based study of risk factors for non-insulin-dependent diabetes mellitus and cardiovascular disease in southern Colorado.

Methods

The rural community of the San Luis Valley includes 44% Hispanics and 55% NHWs, with a median income level below that for Colorado. Researchers contacted all persons in the study area with a previous diagnosis of diabetes. They invited those who were ages 20 to 74, current non-institutionalized residents of the area, judged mentally competent to give informed consent, and spoke either English or Spanish to participate; 440

Table 1. Prevalence of hypertension (JNC-V definition) in rural Hispanics and non-Hispanic whites. Age-adjusted rates (95% confidence intervals) by glucose tolerance and gender for the age group 25 to 74. The San Luis Valley Diabetes Study, Colorado 1984 to 1988

Glucose Tolerance	Hispanics		Non-Hispanic Whites	
	Men	Women	Men	Women
Normal (n=1091)				
Endpoints	53/215	57/227	95/306	87/343
Prevalence	26.1%	31.0%	33.0%	27.1%
95% CI	(20.3–31.9)	(25.2–36.8)	(28.0–37.9)	(22.4–31.8)
Impaired (n=172)				
Endpoints	17/35	29/55	20/34	23/48
Prevalence	37.2%	51.0%	62.6%	42.7%
95% CI	(24.3–50.2)	(38.5–63.5)	(50.2–74.9)	(29.6–55.7)
Diabetic				
Newly diagnosed (n=71)				
Endpoints	6/13	18/30	4/10	13/18
Prevalence	46.4%	55.9%	42.7%	65.9%
95% CI	(18.2–74.6)	(36.2–75.7)	(18.6–66.8)	(41.1–90.8)
Diabetic				
Previously diagnosed (n=357)				
Endpoints	60/93	103/147	44/70	35/47
Prevalence	63.4%	62.9%	60.5%	63.4%
95% CI	(54.2–72.6)	(55.9–70.0)	(47.5–73.4)	(54.2–72.6)

The age structure of the study population was used as the standard for direct age adjustment:
 25–44 yrs : 23.0%
 45–59 yrs : 41.1%
 60–74 yrs : 35.9%

(81%) of the eligible people participated. They selected a random sample of non-diabetic people from the community, stratifying them by age, sex, ethnicity, and county; 1351 (68%) of the eligible non-diabetic people participated. To classify glucose tolerance, researchers used a standard 75-gram oral glucose tolerance test and the World Health Organization (WHO) criteria (4). Detailed methods have been reported elsewhere (5,6).

From the 440 previously known diabetic participants who attended the clinic, 33 did not take insulin or oral agents and had normal glucose tolerance tests; 20 had impaired glucose tolerance (IGT). In addition, 28 participants had insulin-dependent diabetes mellitus (5). Among the 1348 participants without prior diagnosis of diabetes, 71 were classified as diabetic and 173 were classified with IGT. The remaining 1104 participants had normal glucose tolerance.

Researchers used a standard mercury sphygmomanometer with the participant in a supine position to measure blood pressure levels, using the average of the second and third readings. They defined hypertension as a systolic blood pressure ≥ 140 mmHg, diastolic blood pressure ≥ 90 mmHg, or current antihypertensive medication use (7).

Participants' answers to the 1980 U.S. census question, "Are you of Spanish or Hispanic origin or descent?", determined Hispanic ethnicity. Of those answering "Yes,"

39% further identified themselves as Mexican Americans (Mexican, Chicano), 1% as Cuban or Puerto Rican, and 60% as Other Spanish/Hispanic.

Results

The age-adjusted prevalence of hypertension in the SLVDS population is presented in Table 1. The prevalence was significantly higher in people with non-insulin-dependent diabetes mellitus (NIDDM) or IGT, than in those with normal glucose tolerance. The prevalence did not differ significantly by ethnicity or gender, except for lower prevalence among Hispanic males with IGT, compared with NHW males (3).

Table 2 presents the 4-year age-adjusted incidence of hypertension. Of the 861 non-diabetic participants (including those with IGT) who were normotensive at baseline, 664 (77%) returned for a follow-up visit an average of 4 years later, and 70 were found to have developed hypertension (half were on antihypertensive treatment) (10). Only 145 (34%) of the 428 NIDDM participants, including those newly diagnosed by the study, were free of hypertension at the baseline (3). Due to high mortality and co-morbidity, only 106 (73%) in this subgroup completed a follow-up visit, and 36 had developed hypertension (8). The incidence was significantly higher in NIDDM patients than in those with normal or impaired glucose tolerance. There was no significant gender or ethnic difference.

Hypertension risk factors were evaluated separately for non-diabetic participants and for those with NIDDM (3,8–10). In a cross-sectional analysis of 895 normoglycemic participants, excluding those treated for hypertension, systolic and diastolic blood pressure levels were significantly associated with older age, male gender, body mass index (BMI), fasting insulin, and C-peptide (9). In the prospective followup, IGT did not appear to increase hypertension risk. In people ages 25 to 40, BMI above the median cutpoint of 25 kg/m² conferred a nine-fold increase in risk of hypertension. Higher BMI did not alter the hypertension incidence risk of older participants. Incident hypertensive people had baseline systolic blood pressures an average of 10 mmHg higher, and diastolic blood pressures an average 5 mmHg higher, than those who remained normotensive. Those who developed clinical hypertension were also older and had higher heart rates and increased serum triglycerides. Insulin area, a marker of insulin secretion and resistance, was somewhat higher among incident hypertensive people (P=0.06). They did not differ from normotensive people on baseline levels of fasting glucose, insulin, or C-peptide, nor on serum levels of cholesterol and HDL-cholesterol. The risk factor patterns were consistent for participants on medications and hypertensive people classified only by blood pressure levels.

In multivariate analyses, older age and baseline blood

Table 2. Incidence of hypertension (JNC-V definition) in rural Hispanics and non-Hispanic whites. Age-adjusted rates per 100 person-years (95% confidence intervals) by glucose tolerance and gender for the age group 25 to 74. The San Luis Valley Diabetes Study, Colorado 1988 to 1992

Glucose Tolerance	Hispanics		Non-Hispanic Whites	
	Men	Women	Men	Women
Non-Diabetic (n=664)				
Endpoints	17	12	20	30
Incidence	3.4	2.7	3.0	3.9
95% CI	(2.0-5.4)	(1.4-4.8)	(1.8-4.6)	(2.6-5.6)
Diabetic (n=106)				
Endpoints	8	15	11	2
Incidence	6.7	7.3	9.8	6.7
95% CI	(2.9-13.2)	(4.1-12.1)	(4.9-17.5)	(0.8-24.1)

The age structure of the study population was used as the standard for direct age adjustment:

25-44 yrs : 23.0%
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pressure levels significantly and independently predicted the risk of hypertension, while higher BMI and increased pulse rate were significant only in models without baseline blood pressure levels. Among NHW participants untreated for hypertension, but not in Hispanics, there was a significant association between insulin area and change in blood pressure levels, adjusting for baseline blood pressure, age, BMI, change in BMI, and time between visits (ethnic interaction P value=0.009).

In this highly selected group of NIDDM individuals, duration of diabetes (P=0.004) and central obesity (P=0.05) were significantly associated with the risk of hypertension. After adjustment for these variables and age, diabetic Hispanics appeared to be at a lower risk than diabetic NHW (R=0.4; P=0.08).

Discussion

In a population-based study in rural Colorado, the prevalence or incidence of hypertension did not differ between non-diabetic Hispanics and NHW. Among diabetic participants free of hypertension, Hispanic men (but not women) were slightly less likely to develop hypertension than NHW men; however, this difference was not significant. While the patterns of conventional risk factors did not vary by ethnicity, hyperinsulinemia significantly predicted increase in blood pressure over a 4-year period in non-diabetic NHW but not in Hispanics.

The San Luis Valley Diabetes Study did not find major differences in hypertension rates and risk factors between Hispanics and NHW living in rural Colorado. Minor ethnic differences may, however, exist in the strength of the association between blood pressure and insulin levels or insulin sensitivity, as well as in the frequency of hypertension-associated genes.

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