

A Blood Pressure Survey in Nuevo Laredo, Mexico

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THE ENORMOUS HEALTH HAZARD associated with elevated blood pressure has come to be appreciated by health authorities all over the world. As a consequence, large-scale screening programs have been organized to expand our knowledge of the epidemiology of hypertension and to identify people who are unaware of their illness (1-5). An additional important result of the recent mass campaign to measure

blood pressure has been an opportunity to compare the pattern of hypertension in a wide variety of countries. We report here on a community survey in Nuevo Laredo, Mexico. This report provides a point of reference for the study of cardiovascular diseases in the Mexican-American population of the United States.

Methods

The survey in Nuevo Laredo was undertaken by the Mexican Council Against Arterial Hypertension in cooperation with the Mexican Society for the Study of Arterial Hypertension and the Mexican Society of Cardiology. In 1976, 6,351 persons between the ages of 30 and 69

were screened in the municipality of Nuevo Laredo, Tamaulipas, Mexico. Target groups were defined based on the relative distribution of specified occupational class categories in the general population of the city. This distribution is approximate, since a concurrent enumeration of the entire population was not available. People were then recruited from the areas of their residence and workplace so as to provide a representative sampling of each of the target groups. The occupational class categories were defined as shown in the box. Pregnant women and persons currently suffering from a serious medical illness were excluded from the survey. The fieldwork was carried out by health professionals

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Occupational class categories

<i>Group 1</i>	<i>Group 2</i>	<i>Group 3</i>
Household worker	Craftsman	Professional
Fisherman	Foreman	Technical worker
Farm laborer	Clerical worker	Executive
Peasant	Operative worker	

from the public health department of Nueva Laredo, assisted by volunteer medical students from the National University of Mexico. The study personnel, who were trained in the use of a standardized procedure, recorded all data on precoded forms.

Demographic data were collected from the respondents on their age, sex, marital status, level of education, occupation, and previous knowledge of hypertension. A single blood pressure measurement was taken with a standard mercury sphygmomanometer while the person was seated. All technicians measuring blood pressure (BP) were certified in the procedure by the Mexican Council Against Arterial Hypertension according to the recommendations of the World Health Organization. Fifth phase Korotkoff sounds were used to estimate diastolic pressure. BP was measured between the hours of 9 and 12 am at the person's residence or worksite. Data were coded, key-punched, and compiled in tables by the Mexican Society of Cardiology.

Results

The majority of the population were in their thirties; only about 20 percent had an educational level beyond primary school (table 1). As might be expected, the majority were employed in manual or clerical occupations. As can be seen in table 2, systolic BP was slightly lower in women than in men in the younger age groups, but was higher in the group over age 50. Diastolic BP for males rose little over this age span, although a consistent increase was apparent among females; only in the 30-39 year age group was a sex difference apparent; in this age group, the BP of men exceeded that of women by 4.5 mm Hg.

The prevalence rates for hypertension—based on two definitions—

Table 1. Distribution of study population by sex, occupation, education, and age group, Nuevo Laredo blood pressure survey

Classification	Age groups				
	30-39 years	40-49 years	50-59 years	60-69 years	All ages 30-69 years
Sex:					
Male	1,239	798	585	348	2,970
Female	1,378	971	626	406	3,381
Total	2,617	1,769	1,211	754	6,351
Occupational group:					
No. 1	1,255	902	611	427	3,195
No. 2	1,190	781	529	295	2,795
No. 3	165	83	53	29	330
Total	2,610	1,766	1,193	751	6,320
Education:					
Illiterate	228	246	210	218	902
Primary	1,705	1,166	809	457	4,137
Secondary	158	97	69	22	346
Preparatory	59	38	18	11	126
Professional	399	193	79	36	707
Total	2,549	1,740	1,185	744	6,218

Table 2. Systolic and diastolic blood pressure of study population by age group and sex, Nuevo Laredo blood pressure survey

Age group (years)	Male		Female		Both sexes	
	Mean	SD	Mean	SD	Mean	SD
Systolic blood pressure						
30-39	134.9	20.6	128.0	19.2	131.3	20.2
40-49	137.6	23.5	135.1	23.9	136.2	23.8
50-59	142.7	26.0	145.7	29.8	144.2	28.1
60-69	149.8	31.9	156.8	34.3	153.6	33.4
All ages 30-69	138.9	24.5	136.8	26.7	137.8	25.8
Diastolic blood pressure						
30-39	85.1	14.4	80.6	13.5	82.7	14.1
40-49	86.3	16.1	83.4	14.4	84.7	15.2
50-59	86.6	14.1	85.7	15.8	86.1	15.0
60-69	86.6	6.0	87.8	18.0	87.3	17.1
All ages 30-69	85.9	15.0	83.2	15.0	84.5	15.1

NOTE: SD = standard deviation.

are presented by sex and occupational group at each age level in tables 3 and 4. As would be anticipated from table 2, the percentages of hypertensives among men and women were similar overall,

with higher rates among men 30-39 years old and among women in the two oldest age groups. Among occupational groups, a pattern of an increasing prevalence of hypertension is apparent as one moves from

Table 3. Number and percent of hypertensives with diastolic blood pressure ≥ 90 , by demographic characteristics, Nuevo Laredo blood pressure survey

Classification	Age groups									
	30-39 years		40-49 years		50-59 years		60-69 years		All ages 30-69 years	
	Number	Percent	Number	Percent	Number	Percent	Number	Percent	Number	Percent
Sex:										
Male	378	30.5	260	32.6	194	33.2	124	35.2	956	32.2
Female	269	19.5	276	28.2	206	32.9	151	37.2	902	26.6
Total	647	24.7	536	30.2	400	33.0	275	36.5	1,858	29.2
Occupational group:										
No. 1	254	20.2	269	29.8	207	33.3	156	36.6	886	27.7
No. 2	336	28.2	231	29.6	168	31.8	106	35.9	841	30.1
No. 3	56	33.9	33	38.8	24	45.3	11	37.9	124	37.4
Total	646	24.8	533	30.2	399	33.2	273	36.4	1,851	29.2
Education:										
Illiterate	52	22.8	63	25.6	71	33.6	76	34.9	262	29.0
Primary	422	24.8	367	31.5	265	32.8	173	37.9	1,227	29.7
Secondary	45	35.2	30	30.9	18	26.1	5	22.7	98	31.0
Preparatory	14	23.7	12	31.6	8	44.4	3	27.3	37	29.4
Professional	107	26.8	57	29.5	32	40.5	11	30.6	207	29.3
Total	640	25.4	529	30.4	394	33.2	268	36.0	1,831	29.6

Table 4. Number and percent of hypertensives with systolic blood pressure ≥ 160 mm Hg, by demographic characteristics and age group, Nuevo Laredo blood pressure survey

Classification	Age groups									
	30-39 years		40-49 years		50-59 years		60-69 years		All ages 30-69 years	
	Number	Percent	Number	Percent	Number	Percent	Number	Percent	Number	Percent
Sex:										
Male	86	6.9	73	9.1	92	15.7	85	24.4	336	11.3
Female	61	4.4	93	9.5	125	19.9	138	33.9	417	12.3
Total	147	5.6	166	9.3	217	17.9	223	29.5	753	11.8
Occupational group:										
No. 1	64	5.1	99	10.9	136	22.2	146	34.1	445	13.9
No. 2	69	5.8	64	8.2	73	13.8	67	22.7	273	9.7
No. 3	13	7.9	13	15.6	7	13.2	8	27.5	41	12.4
Total	146	6.0	176	10.0	216	18.1	221	29.4	759	12.0
Education:										
Illiterate	22	9.6	19	7.7	49	23.3	68	31.1	158	17.5
Primary	102	5.9	128	10.9	141	17.4	142	31.0	513	12.4
Secondary	7	4.4	3	3.0	6	8.7	2	9.0	18	5.2
Preparatory	2	3.3	2	5.2	7	38.8	3	27.2	14	11.1
Professional	12	3.0	20	10.3	12	15.1	6	16.6	50	7.0
Total	145	5.6	172	9.8	215	18.1	221	29.7	753	12.1

Table 5. Systolic and diastolic blood pressure of study population by age and occupational group, Nuevo Laredo blood pressure survey

Age group (years)	Occupational group No. 1		Occupational group No. 2		Occupational group No. 3		Occupational group No. 4	
	Mean	SD	Mean	SD	Mean	SD	Mean	SD
<i>Systolic blood pressure</i>								
30-39	129.2	20.0	132.65	19.6	137.29	22.8	131.3	20.2
40-49	137.1	25.7	134.88	22.5	145.37	28.7	136.5	24.6
50-59	147.6	29.7	140.97	25.4	145.11	26.5	144.6	27.9
60-69	157.7	34.6	147.37	30.8	156.74	32.8	153.6	33.5
All ages 30-69	138.6	27.8	136.40	23.5	142.29	26.6	137.9	25.9
<i>Diastolic blood pressure</i>								
30-39	80.6	13.7	84.3	13.7	86.96	17.8	82.7	14.1
40-49	83.8	14.2	85.3	15.5	89.15	21.3	84.7	15.3
50-59	85.7	15.4	86.2	13.6	90.26	20.1	86.1	15.0
60-69	87.3	18.0	87.0	15.7	86.57	12.4	87.2	16.9
All ages 30-69	83.4	15.0	85.2	14.7	88.01	18.8	84.5	15.1

NOTE: SD = standard deviation.

the manual to professional and executive categories. This trend is not apparent for hypertension defined as systolic BP over 160 mm Hg. In both instances, it should be noted, the estimates in occupational group 3 are based on small numbers. The potential relationships between occupation and BP are shown in table 5, which presents the mean values for systolic and diastolic BP by occupational group. For systolic pressure, a trend toward higher values with increasing occupational status is apparent for the two younger groups; for diastolic pressure, this trend is apparent until age 60. The differences between occupational groups 2 and 3 are statistically significant for systolic pressure; for diastolic pressure, significant differences were found between groups 1 and 2 and between groups 2 and 3 (based on the Scheffé method of testing for multiple comparisons ($P < 0.05$)).

Discussion

From this initial community survey, it is apparent that untreated hypertension is a significant public health

problem in Nuevo Laredo. With the criterion of a diastolic pressure over 90 mm Hg, a prevalence rate for hypertension of about 30 percent was found in this population. In members of the U.S. population aged 30-69 years screened in the national collaborative Hypertension Detection and Followup Program, 25.3 percent had a diastolic pressure over 90 mm Hg (5). With the criterion of definite hypertension (systolic BP greater than 160 mm Hg), the prevalence rate in Nuevo Laredo was approximately 12 percent for this age range. Unfortunately, since age groups are defined differently in this study than in the U.S. National Health and Nutrition Examination Survey data of 1971-74 (NHANES I), age-specific comparisons are difficult (6). By the same token, a mean of three readings was used in NHANES, and persons with a diastolic BP over 95 were included; also, the age distributions were not identical in the two surveys. Despite these differences between the surveys, the prevalence rates for hypertension in Nuevo Laredo are comparable to

the rates for U.S. whites and considerably lower than those for U.S. blacks (6). Mean blood pressure was in the range that is commonly reported in modern community surveys.

Perhaps one of the most important observations based on the new generation of BP studies from societies all over the world is that hypertension prevalence rates are similar. Thus, when World Health Organization criteria for the entire adult population are used, prevalence rates in the range of 10 percent are generally reported, with the notable exception of the black population in the United States (1-4). Although a somewhat narrower age range was studied in this survey, the results are generally consistent with that trend. Previous reports from Mexico have given somewhat lower prevalence rates, but the samples studied were not representative of the general population (7). The morbid sequelae of hypertension, particularly strokes, are common in Mexico and further attest to the widespread prevalence of untreated hypertension (8).

Hypertension surveys from other areas in Latin America demonstrate that the disease is common, at least in urbanized populations (9,10). The enormous diversity of social and ethnic background in Latin America, however, necessitates clear demographic distinctions. A number of rural population groups are known to have remarkably little hypertension (11-13). Also, in at least one survey of blacks in Latin America, BP was not exceptionally high (14). Within the United States, it would appear that the Hispanic (primarily Mexican-American) population has rates of hypertension between those of whites and blacks (15-17). It is likely that environmental factors, for example, social conditions, are the primary determinant. Differences in hypertension rates under different social conditions have been observed in comparisons between blacks in the United States and in Africa (18).

Our study has two important shortcomings. First, body weight was not recorded. Since body weight is such an important determinant of BP, our data can only be presented as descriptive; they provide little insight into causative relationships. Second, data on hypertension treatment were not recorded. The level of control of hypertension in the United States of roughly 50 percent indicates that survey data will be significantly influenced by treatment patterns. The current degree of hypertension control in Nuevo Laredo is unknown. In a recent study from Laredo, Texas, immediately across the border, a control rate of 37 percent was found for men and 77 percent for women in 1979 (15). It must be assumed, therefore, that the figure presented here underestimate the hypertension rates.

Even given the limitations just described, the association between

the gradient of hypertension and occupational class is interesting. In societies like that of the United States, a negative association between BP and occupational class has usually been reported (19,20). Poor people tend to be fatter in industrialized societies, and this tendency also was found among the Mexican-American population in the Laredo survey (15). In general, also, people with higher incomes tend to get better medical care. Both these factors would have the effect of raising the relative prevalence rates of hypertension among the workers and farmers in the lower occupational categories, as we have reported here. The significantly higher BP levels in the professional and managerial group despite these confounding factors supports the finding of a positive association of BP with occupational class. It is interesting to speculate that the presence in a community of many people who have recently left villages and farms and have not yet been thoroughly integrated into the industrial economy may account for a continued lower prevalence of hypertension. What we observed in Nuevo Laredo may be an earlier stage in the evolution of mass disease than that found in the U.S. population. If so, as these persons from villages and farms enter urban occupations and adopt a modern lifestyle, the risk factors that account for increased hypertension among the poor and minority populations of industrialized populations may reverse the relationship between occupational class and BP that we observed (21).

Although a number of studies are currently underway or have been reported in abstract form, little information is available from cardiovascular studies of the second largest minority population in the United States, persons of Hispanic origin (22-24). This report pro-

vides information on the Mexican population living in close proximity to the U.S. border. It will be interesting to see how social conditions mold the pattern of cardiovascular diseases as the relationship between the two countries develops and their populations intermingle. The process has already been observed in respect to cancer (24). Furthermore, this relationship provides an excellent opportunity for cooperative research between Mexico and the United States based on the natural experiment of immigration. The results reported here suggest that a survey in which rural and urban Mexican and Mexican-American populations were compared by similar methods might provide clues that would help elucidate the role that social etiology plays in hypertension.

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SYNOPSIS

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A blood pressure survey was carried out in 1976 in the city of Nuevo Laredo, Mexico, which involved 6,351 persons 30-69 years old. The study sample was recruited so as to represent an approximation of the overall distribution of occupational classes in the urban population. Members of the population sample were relatively young and of low educational attainment. To the extent that comparisons

among surveys are feasible, mean blood pressure levels and hypertension rates were roughly comparable to those found in the white population of the United States. Although no firm conclusions can be drawn from the survey, a trend toward somewhat higher hypertension rates within the professional and managerial class was observed in some age groups in Laredo.