

# Prevalence of hypertension, obesity and smoking in three Indian communities in northwestern Ontario

Lynn McIntyre,\* MD, MHSc  
Chandrakant P. Shah,† MD, MRCP (Glasg),  
FRCPC, FAAP, FACPM, SM (Hyg)

Hypertension is perceived to be an important problem among native people in Canada, but specific prevalence data have not been accumulated. A study was carried out to determine community levels of blood pressure and to document the prevalence of hypertension, obesity and cigarette smoking in nonurban Indians in three communities in northwestern Ontario. Of the 678 people present in the communities at the time of the survey 668 (98.5%) participated. Age- and sex-specific mean diastolic and systolic blood pressure readings are presented. The overall prevalence rate of hypertension was 13%; in 9.6% of those with hypertension the condition had previously been diagnosed. Blood pressure generally rose with increasing age, but diastolic pressure declined after age 50 in both sexes. The rate of obesity increased with increasing age; 70% of women aged 35 to 64 years and 50% of men aged 35 to 44 years were obese. Over half (56.4%) of the study population smoked, and most smokers were less than 35 years old.

Si l'importance de l'hypertension artérielle est reconnue chez les autochtones du Canada, on manque de données précises sur sa fréquence. On a entrepris une étude de la population indienne de trois villages du nord-ouest de l'Ontario afin d'établir les moyennes de la pression artérielle systolique et diastolique selon l'âge et le sexe ainsi que la prévalence de l'hypertension artérielle, de l'obésité et de l'usage de la cigarette. Le taux de participa-

From †the Department of Preventive Medicine and Biostatistics and \*the Community Medicine Residency Program, University of Toronto, and ‡the Department of Paediatrics, Hospital for Sick Children, Toronto

Reprint requests to: Dr. Chandrakant P. Shah, Department of Preventive Medicine and Biostatistics, Rm. 402, McMurrich Building, University of Toronto, Toronto, Ont. M5S 1A8

## Original Research

tion est de 98,5% (668 sujets sur 678). Dans l'ensemble de cette population il existe une hypertension chez 13% des sujets; seuls 9,6% des hypertendus étaient déjà connus. Les moyennes augmentent avec l'âge, à ceci près que la pression diastolique baisse après 50 ans dans les deux sexes. Le taux de l'obésité augmente aussi avec l'âge; il atteint 70% chez les femmes de 35 à 64 ans et 50% chez les hommes de 35 à 44 ans. Plus de la moitié (soit 56,4%) des sujets fument; la plupart des fumeurs n'ont pas 35 ans.

**H**ypertension is an important health problem in Canada. In the Canada Health Survey it was found that 15.9% of Canadians over age 15 years had a sufficient elevation in blood pressure to warrant medical intervention.<sup>1</sup> Other Canadian studies have reported hypertension in 10% to 15% of the population.<sup>2-4</sup> The problem is perceived to be important among native people as well, but specific prevalence data have not been accumulated. In the United States, however, hypertension affects approximately 15% of urban Indians.<sup>5</sup>

The pattern of health and sickness among native people in Canada has altered significantly since the Second World War as a result of rapid social and lifestyle changes.<sup>6,7</sup> This acculturation is thought to be responsible for the higher blood pressure levels seen in the native population.<sup>8,9</sup>

Since the age distribution of the native population resembles that of populations in developing countries, the extent to which hypertension and its complications contribute to overall illness and death among native people is not easily appreciated. Nevertheless, cardiovascular disease accounts for 20% to 25% of all deaths among registered Indians and represents a significant health problem in terms of proportionate mortality and rate of hospitalization.<sup>10</sup>

The objectives of this study were to determine community levels of blood pressure for nonurban Indians in northwestern Ontario and to document the prevalence among these people of hypertension, obesity and cigarette smoking.

## Methods

The Sioux Lookout Zone, in northwestern Ontario, is a health service area of the Medical Services Branch, Department of National Health and Welfare. It serves a well defined, geographically isolated, socially homogeneous population. About 10 000 Cree and Ojibwa Indians inhabit some 30 remote settlements scattered in the sub-arctic boreal forest. The health services of this area have previously been described.<sup>11,12</sup>

The Sioux Lookout Zone provides virtually exclusive medical care to its native residents and has a complete medical records system. Patients with chronic diseases, including hypertension, are usually seen monthly by the nurses when medication is dispensed and at least annually by a visiting physician.

Three isolated Indian communities in the Sioux Lookout Zone were chosen for a cross-sectional blood pressure survey conducted over 7 days in July and August 1983. The eligible population included all community residents aged 15 years or older.

Blood pressure was measured by one of us (L.M., field physician for the communities) using an appropriately sized cuff with the subject seated and the arm supported at midchest level after 5 minutes of relaxation. A single measurement was made unless the reading was "missed", in which case it was repeated. One portable mercury manometer was used for all blood pressure measurements instead of the more cumbersome random-zero sphygmomanometer. Fifth-phase diastolic blood pressure was used. Height and weight were also measured, and the subject was asked to respond to questions about smoking habits and previous diagnosis of high blood pressure.

The choice of a single blood pressure measurement on one occasion was for epidemiologic and risk-assessment purposes. Demonstration by medical personnel of sustained blood pressure elevation over several weeks was required for clinical diagnosis.

The medical charts of all residents aged 15 years or older were reviewed with respect to previous diagnosis of hypertension and evidence of control.

Elevated blood pressure was defined as diastolic pressure of 95 mm Hg or more, or systolic pressure of 160 mm Hg or more, or both. Diastolic pressure of 90 to 94 mm Hg or systolic pressure of 140 to 159 mm Hg was considered borderline. Hypertension in a given patient was considered to be controlled if, over a 6-month period, most of the blood pressure readings recorded in the medical

chart (usually completed by outpost nurses on at least a quarterly basis) were not elevated.

Weight and height data were tabulated as body mass index, calculated as  $(\text{weight}) \div (\text{height})^2$ , where weight is expressed in kilograms and height in metres. Body mass index has been widely used as a measure of weight level in epidemiologic investigations.<sup>13</sup> Obesity was defined as an index greater than 27 in males or greater than 25 in females.<sup>14,15</sup>

Two-tailed tests were used to assess statistical significance. Results were considered significant at the  $p < 0.05$  level.

## Results

We identified 780 eligible subjects; the male:female ratio was 1.03:1. At the time of the study 102 people were temporarily absent from their communities, either working or visiting other communities. Of the 678 eligible people available 668 (98.5%) participated in the survey. The male:female ratio was 0.95:1; significantly more males than females were away from their communities ( $p < 0.04$ ).

### *Blood pressure*

Community blood pressure values were derived from data collected during screening. The mean systolic and diastolic blood pressure readings, by sex and age, are shown in Tables I and II respectively. Mean systolic blood pressure in the lowest two age groups was considerably higher for males than for females. As in most populations, blood pressure rose with increasing age in both sexes. However, for both sexes mean diastolic blood pressure was about 5 mm Hg lower in those aged 65 years or more than in those aged 45 to 54 years.

### *Hypertension*

The prevalence of hypertension was calculated from the number of subjects previously known to be hypertensive plus an estimate of the number of those with previously undiagnosed hypertension. The chart review identified 75 people with previously diagnosed hypertension, 67 of whom participated in the survey. The diagnosis was verified by reviewing the blood pressure readings recorded in the medical chart during the 6 months following the survey. The prescreening prevalence rate of hypertension was 9.6% in the total population (780 people) and 9.9% in the available population (678).

In the initial blood pressure screening 54 subjects (37 males and 17 females), 8.1% of the study sample, had borderline or definite hypertension that had not previously been diagnosed. These people were referred to the community

**Table I—Mean systolic blood pressure in 668 Canadian Indians in northwestern Ontario, by sex and age**

Sex; age, yr	Systolic blood pressure (mm Hg), mean (and standard deviation [SD])
<b>Both</b>	
15-19 (n = 133)	119.2 (12.3)
20-24 (n = 115)	120.3 (11.5)
25-34 (n = 146)	123.1 (12.0)
35-44 (n = 96)	125.8 (14.7)
45-54 (n = 82)	130.6 (13.5)
55-64 (n = 40)	137.4 (17.0)
≥ 65 (n = 56)	143.9 (22.4)
All	125.7 (15.9)
<b>Male</b>	
15-19 (n = 67)	123.2 (12.3)
20-24 (n = 54)	127.5 (11.0)
25-34 (n = 77)	126.6 (11.4)
35-44 (n = 40)	129.6 (13.8)
45-54 (n = 41)	130.9 (13.0)
55-64 (n = 19)	132.6 (18.3)
≥ 65 (n = 30)	145.2 (26.4)
All (n = 328)	129.0 (15.4)
<b>Female</b>	
15-19 (n = 66)	115.2 (11.0)
20-24 (n = 61)	114.0 (9.2)
25-34 (n = 69)	117.8 (11.5)
35-44 (n = 56)	123.0 (14.8)
45-54 (n = 41)	130.2 (14.2)
55-64 (n = 21)	141.7 (15.0)
≥ 65 (n = 26)	142.4 (17.1)
All (n = 340)	122.6 (15.6)

**Table II—Mean diastolic blood pressure, by sex and age**

Sex; age, yr	Diastolic blood pressure (mm Hg), mean (and SD)
<b>Both</b>	
15-19	70.2 (10.8)
20-24	71.8 (10.8)
25-34	76.4 (9.3)
35-44	77.7 (9.8)
45-54	79.3 (8.5)
55-64	76.9 (8.6)
≥ 65	72.3 (11.1)
All	74.8 (10.5)
<b>Male</b>	
15-19	72.0 (10.8)
20-24	77.2 (10.0)
25-34	77.4 (10.3)
35-44	79.9 (10.4)
45-54	81.7 (8.8)
55-64	80.0 (7.8)
≥ 65	76.1 (10.6)
All	77.1 (10.5)
<b>Female</b>	
15-19	68.3 (10.5)
20-24	67.0 (9.3)
25-34	75.3 (8.8)
35-44	76.2 (9.1)
45-54	77.0 (7.7)
55-64	75.1 (9.1)
≥ 65	72.1 (11.4)
All	72.6 (10.1)

nurses and physicians for assessment and, if required, treatment. Of the 54, 42 (78%) were re-examined by nurses and field physicians over the 6 months following the survey. Hypertension was diagnosed in 18, and they received treatment. The positive predictive value of a subject's having an initially elevated reading and subsequent confirmation of hypertension was therefore 42.9%. Among the 18 the male:female ratio was 2.4:1. Eight males and one female were aged 15 to 34 years. The diagnosis of hypertension was more evenly distributed between men and women in the higher age groups: equal numbers of men and women aged 45 to 64 were found to have the disease. After age 65 more women than men were hypertensive, which reflected the former's greater numbers in this age group.

If all of those not followed up were hypertensive, the rate of undiagnosed hypertension in the population would be 4.5%; if none were hypertensive, the rate would be 2.7%. If the positive predictive value for those not followed up were also 42.9%, the rate of undiagnosed hypertension in the population would be 3.4%.

The prevalence rate of hypertension in the screened population was 13.3%. If 3.4% of the unscreened residents also had undiagnosed hypertension, the adjusted prevalence rate would be 13%.

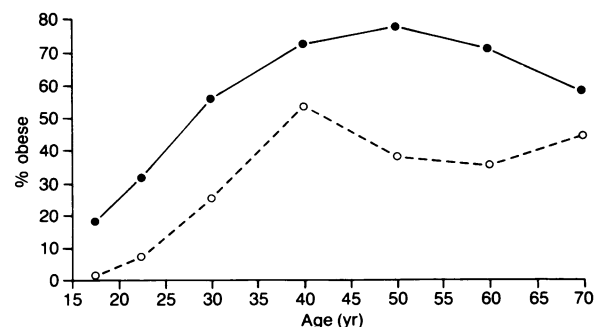
### Obesity

The prevalence of obesity, by age and sex, is presented in Fig. 1. The proportion of the population that was obese increased with increasing age. Over 70% of women between the ages of 35 and 64 were obese. The highest rate of obesity in males was in those aged 35 to 44, after which the rate declined.

Obesity was significantly related to hypertension ( $p < 0.001$ ) but was dependent on age.

### Smoking

Over half of the subjects (56.4%) smoked, 37.4% of them on a daily basis (Table III). The vast majority of smokers were under 35 years of age.



**Fig. 1—Prevalence of obesity, by age and sex. ● = females; ○ = males.**

Males consistently smoked more cigarettes per day, had been smoking longer and were more regular smokers than females. The highest rate of smoking was in those aged 15 to 24 years; with the exception of this age group, nonsmokers outnumbered smokers at all ages. There were very few smokers over 65 years of age.

Daily smoking was not related to hypertension, although longer duration of smoking (usually an effect of age) was positively related. The amount smoked was not related to hypertension, probably because heavier smoking occurred in the younger subjects.

## Discussion

The systolic blood pressure values in our subjects paralleled those in other populations as a whole. However, diastolic blood pressure was consistently lower than in other Canadians, Americans and American Indians.<sup>1,5,16,17</sup> The absolute differences in diastolic blood pressure were greatest for both sexes over age 65. This may be due to genetic differences between groups or to later acculturation of our subjects.

Our findings in three communities in the Sioux Lookout Zone suggest that 13% of the population over age 15 are hypertensive; in the vast majority the disease had previously been diagnosed. Those known to be hypertensive were generally female and were aware of their condition, and the condition was controlled.

The more frequent detection of hypertension in males shows the need for improved screening

for chronic conditions such as hypertension in this population, particularly in those aged 15 to 34.

The Nutrition Canada Indian Survey,<sup>18</sup> which provided some data on obesity based on the ponderal index, showed that Indian men were lighter than other Canadian men up to age 40 to 49 but had a substantial weight gain after age 50. Indian women were heavier at all ages. These rates of obesity for women were replicated in our study, but the pattern in men was not.

The proportion of Canadians who smoke has declined steadily since 1965, and the current rate among Ontarians, 31%, is one of the lowest in Canada.<sup>19</sup> However, young women (aged 15 to 19) are the exception in this decline.<sup>19</sup> Although smoking rates among Indians have not been studied nationally, an alarming rate of smoking among Indian schoolchildren in the Northwest Territories has been reported.<sup>20</sup> We found that smoking was particularly prevalent among young Indians, especially women. This may augur a trend toward increased illness and death from smoking-related diseases, and more effort should be made to promote health and smoking cessation programs among young Indians.

The nonparticipation of the 102 residents absent from the communities represents a potential response bias. However, the ages of those absent were similar to those of the subjects. There was no difference in the rate of previously diagnosed hypertension between those who were absent (7.8%) and the subjects (9.9%). Given the reasons why residents were absent, it seems unlikely that people left their communities to avoid participation in the survey or were unable to leave

Table III—Prevalence of smoking, by age and sex

Age, yr; sex	% of subjects					
	Nonsmoker	Occasional smoker	Daily smoker; no. of cigarettes/d			
			1-4	5-9	10-19	≥ 20
15-24						
Male (n = 121)	26.4	24.8	10.7	4.1	24.0	9.9
Female (n = 126*)	31.0	31.7	9.5	8.7	17.4	1.6
25-34						
Male (n = 77)	27.3	17.3	2.6	2.6	32.5	20.8
Female (n = 69)	58.0	17.4	8.7	4.3	11.6	0.0
35-44						
Male (n = 40)	40.0	10.0	7.5	5.0	25.0	12.5
Female (n = 56)	75.0	10.7	7.1	3.6	3.6	0.0
45-54						
Male (n = 41)	48.8	7.3	7.3	2.4	17.1	17.1
Female (n = 41)	51.2	22.0	17.1	2.4	4.8	2.4
≥ 55						
Male (n = 49)	46.0	12.0	10.0	4.0	20.0	8.0
Female (n = 46*)	80.0	13.3	4.4	2.2	0.0	0.0
All						
Male	34.0	16.4	8.2	3.6	24.6	12.8
Female	52.8	21.7	9.5	5.3	10.1	0.9
Total	43.5	19.1	8.9	4.5	17.3	6.8

\*One subject did not give a smoking history.

because of known or previously undetected hypertension.

The very high participation rate in our study, 98.5%, may indicate that the population surveyed was highly interested in the blood pressure program and was receptive to this kind of medical screening.<sup>21</sup> The rate of follow-up in those with abnormal readings, 78%, also reflects this interest.

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## ◀ PRESCRIBING INFORMATION ▶

# ERYC<sup>\*</sup>

Erythromycin, USP  
Encapsulated enteric-coated pellets

**Indications:** The treatment of the following infections when caused by susceptible strains of micro-organisms: upper and lower respiratory tract infections; skin and soft tissue infections; gonorrhoea; syphilis; Legionnaires' disease; pertussis; diphtheria; short term prophylaxis of bacterial endocarditis in patients hypersensitive to penicillin.

**Contraindications:** Known hypersensitivity to erythromycin.

**Precautions:** The possibility of superinfection caused by overgrowth of nonsusceptible bacteria or fungi should be kept in mind during prolonged or repeated therapy with ERYC. In such instances, the administration of ERYC should be discontinued and appropriate treatment instituted if necessary. Erythromycin is excreted principally by the liver. Caution should be exercised when administering ERYC to patients with impaired hepatic function.

The concomitant administration of erythromycin and high doses of theophylline may be associated with increased serum theophylline levels and possible theophylline toxicity. The dose of theophylline may require reduction while patients are receiving ERYC.

The safety of ERYC for use in pregnant patients has not been established. There is placental transfer and excretion of erythromycin in breast milk.

**Adverse Effects:** The most frequent side effects are gastrointestinal and are dose-related. They include nausea, vomiting, abdominal pain, diarrhea and anorexia. Symptoms of hepatic dysfunction and/or abnormal liver function test results may occur.

Serious allergic reactions have been extremely infrequent.

Mild allergic reactions such as rashes with or without pruritis, urticaria, bullous eruptions and eczema have been reported with erythromycin.

**Dosage:** The most reliable serum levels of erythromycin are achieved when ERYC capsules are taken one hour before meals or in the fasting state.

**Adults:** The usual dose is 250 mg (one capsule) every 6 hours taken one hour before meals. If twice-a-day dosage is desired, the recommended dose is 500 mg (two 250 mg capsules) every 12 hours. Twice-a-day dosing is not recommended when doses larger than 1 g daily are administered.

In the treatment of streptococcal infections, a therapeutic dosage of erythromycin should be administered for at least 10 days. In continuous prophylaxis of streptococcal infections in persons with a history of rheumatic heart disease, the dose is 250 mg twice-a-day.

For the prevention of bacterial endocarditis due to alpha-hemolytic streptococci in penicillin-allergic patients with valvular heart disease who are to undergo dental procedures or surgical procedures of the upper respiratory tract, the recommended dose for adults is 500 mg 1.5 to 2 hours prior to the procedure and then 500 mg every 8 hours for at least 3 days.

**Primary syphilis:** 2-4 grams per day for a period of 10-15 days.

**Intestinal amebiasis:** 250 mg four times daily for 10-15 days for adults. For treatment of Legionnaire's disease: although optimum doses have not been established, doses used in reported clinical data were 1 to 4 g daily in divided doses.

**How supplied:** ERYC capsule is a two-tone clear and orange opaque capsule, each containing 250 mg erythromycin base as enteric-coated pellets. Available in bottles of 100.

Store at a room temperature below 30°C. Protect from moisture and light. Full prescribing information available on request.

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