Acute Myocardial Infarction among Navajo Indians, 1976–83

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Abstract: We found that from 1976 through 1983 the incidence of acute myocardial infarction (AMI) diagnosed among Navajo Indians remained low (0.5 per 1,000 persons age 30 years or more), although the incidence in women appears to be climbing. Navajo AMI patients are more likely to be hypertensive and diabetic than age- and sex-matched patients with gallbladder disease. Twenty-four per cent die within one month of AMI. (*Am J Public Health* 1986; 76:412–414.)

Introduction

Southwestern American Indians have a low prevalence of coronary heart disease, documented by clinical case reports,[1–3] death certificate data,[4] postmortem anatomic studies,[5,6] and population surveys.[7–10] Few smoke cigarettes,[11,12] and cholesterol levels average 20–40 mg per cent lower than those of comparison Caucasian groups.[13–16] On the other hand, diabetes mellitus is prevalent, and obesity is frequently observed.[17–20] Navajo, Apache, Papago, and other Southwestern tribes have a moderate and perhaps increasing prevalence of hypertension.[7,8,12,21–23] Sievers and Fisher reported that acute myocardial infarction is also increasing in frequency among all Southwestern tribes.[24]

While most tribes are small, leading to unstable rate estimates for diseases, the Navajo comprise almost 150,000 people in a defined geographical area. This survey reviews diagnosed acute myocardial infarction (AMI) among Navajo Indians during eight years (1976–83), and compares clinical characteristics and risk factors of these patients to those of age- and sex-matched patients with gallbladder (GB) disease, a "traditional" and frequent Navajo ailment.

Methods

The US Public Health Service (PHS) operates five hospitals and three major clinics in and around the Navajo Indian Reservation in Northwest Arizona and Northwest New Mexico. A nonprofit Navajo corporation runs an additional hospital in this area. All participate in a centralized data collection system for inpatient and outpatient services. Some Navajo who live on the reservation receive care from non-PHS hospitals elsewhere, either when admitted for an emergency or referred for specialized services; discharge diagnoses of these patients are also available through the PHS Office of Contract Care.

We reviewed hospital charts of all Navajos discharged with the diagnosis of AMI 1976–1983. This review was conducted at two times, in 1980 for the first four years, and in 1984 for the second. Confirmation of AMI required: 1) serial electrocardiographic changes of ST segment elevation with later inversion of T waves, evolving through the appearance of Q waves 0.04 seconds or greater in duration; or 2) EKG changes of ST elevation and T inversion, associated with serial elevations of creatine phosphokinase in blood (two times upper limit of normal). The first criterion was the same as that employed by Sievers in his reviews of AMI among Southwestern Indians.[3,24]

For each AMI patient identified, a comparison patient was selected from among those discharged with a diagnosis of cholelithiasis or cholecystitis. The comparison patient was matched for sex, ten-year age group, and hospital. Confirmation of gallbladder (GB) disease required an abnormal oral cholecystogram, or abnormal pathology report if surgery was performed.

For the second four years (1980–83), we also reviewed hospital charts of all Navajos with a primary discharge diagnosis indicating ischemic heart disease other than AMI. These included: angina pectoris, acute ischemic heart disease, unstable angina, and chronic ischemic heart disease.

We considered patients hypertensive if this diagnosis was recorded or if they had blood pressure readings of 140/90 or over on three sequential outpatient visits, prior to the index hospitalization. We considered patients diabetic if the diagnosis was recorded, or if they met Fajans and Conn's criteria for abnormal fasting or postprandial blood sugars.[25] When both height and weight were noted on the chart, obesity was diagnosed if the person was more than 10 per cent above the upper limit of normal weight for a large-framed individual of the given height.[26] In most cases, no height was recorded; we considered the person "obese" only if such a diagnosis was recorded.

Our estimates of the Navajo population by age group and sex were those developed by the Navajo Area PHS for fiscal year 1977 (first four year denominator), and fiscal year 1981 (second four year denominator).* We used McNemar's test for paired comparisons to ascertain differences in risk factors or associated diseases between AMI and GB patients, and estimated 95 per cent confidence intervals for relative risks.[27]

Results

During the eight-year study period, we identified 196 Navajos discharged with diagnoses of acute myocardial infarct (AMI), of which 144 (38 women and 106 men, or 77 per cent) were confirmed by our criteria. Sixty-one AMIs occurred during the first four years (1976–79) and 83 during the second four years (1980–83). Table 1 shows that the incidence of diagnosis increased among women but not among men. Table 2 shows that hospitalization rates for AMI and ischemic heart disease among Navajos is lower than those in the US population as a whole.[28]

Of documented AMIs, 68 (47 per cent) were anterior, anteroseptal, or anterolateral in localization; 48 (33 per cent) were inferior or posterior; 13 (9 per cent) were subendocardial; and 15 (10 per cent) were indeterminate. Thirty-four deaths (24

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*Population estimates, Navajo Area Indian Health Service, Window Rock, AZ.

TABLE 1—Hospitalization Rates for Definite AMI among Navajos by Age Group and Sex, 1976–83

Age Group (years)	Men		Women	
	1976–79	1980–83	1976–79	1980–83
35–44	0.1*	0.1	0.0	0.1
45–54	0.7	0.5	0.0	0.3
55–64	0.9	1.3	0.1	0.8
65+	2.4	2.2	0.6	1.8

*Cases/1000 persons/year.

TABLE 2—Navajo (1976–83) and US (1979) Discharge Rates for Acute Myocardial Infarction and Ischemic Heart Disease (Both Sexes)

Age Group (years)	Acute Myocardial Infarction		Other Ischemic Heart Disease**	
	Navajo*	United States†	Navajo	United States
15–44	0.1	0.3	0.3	0.8
45–64	0.6	4.3	1.2	12.6
65+	1.8	9.4	3.7	28.6

*Cases/1000 persons/year.
**Includes angina pectoris, coronary atherosclerosis, acute ischemic heart disease (excluding AMI), and chronic ischemic heart disease.
†See reference 28.

per cent) occurred within one month of the infarct, and half of these were within the first 24 hours. Data on complications during hospitalization were only obtained on 1980–83 patients, of whom 41 (57 per cent) had ventricular arrhythmias, 40 (56 per cent) had congestive heart failure, and 10 (14 per cent) had cardiogenic shock. Nine of the 1980–83 patients (12 per cent) underwent coronary arteriography at some point, and six of these had coronary bypass surgery.

During 1980–83, another 133 patients were discharged with primary diagnoses indicating ischemic heart disease, but excluding AMI. Forty-eight (36 per cent) of these had resting EKG changes consistent with ischemia or old AMI, 15 (11 per cent) had either positive exercise stress tests or angiography, and 70 (53 per cent) were diagnosed on the basis of clinical history and physical examination. Nine (7 per cent) of these patients died within one month of hospitalization, a rate lower than that for patients with AMI. The percentage of cases in women was about the same for ischemic heart disease (38 per cent) as for AMI (34 per cent).

Table 3 presents data on risk factors and associated diseases for 144 AMI patients and 144 paired patients with gallbladder disease. Hypertension and diabetes (32 per cent versus 17 per cent) were more frequently seen in AMI patients. Hypertension, known to be increasing in prevalence among the Navajo, was noted in 28 per cent of 1976–79 patients and 42 per cent of 1980–83 AMI patients. Among age- and sex-matched gallbladder patients, hypertension was observed in 5 per cent during the first time period and 20 per cent during the second. Obesity was diagnosed in 21 AMI and seven GB men; thus demonstrating a substantial association somewhat lessened when both sexes are combined. Twenty AMI patients (24 per cent) in 1980–83 also had chart-review criteria for gallbladder disease, and 15 (18 per cent) of gallbladder patients met criteria for ischemic heart disease, other than AMI, during the study period.

Discussion

In over 10,000 admissions to one Navajo hospital during 1949–52, Gilbert found no cases of AMI.[1] Fulmer and Roberts evaluated the adult population of a Navajo community (Many Farms) from 1956 through 1962, and found four new cases of ischemic heart disease, two each of AMI and angina, among 508 persons aged 30 years or older.[9] The annualized attack rate for AMI would be 0.7 per 1,000. Sievers reviewed 138 documented AMIs in patients from various Southwestern tribes and calculated an annual attack rate of 1.0 per 1,000 for Navajo and Hopis over 40 years of age during the period 1957 through 1966.[3] Subsequently, Sievers and Fisher reported that AMIs were occurring more frequently among Southwestern Indians during 1975–78 as compared to the earlier period.[24] In particular, the attack rate for Athabascans (Navajos and Apaches) had almost doubled. However, the 67 AMIs reviewed were drawn from 10 hospitals serving 58,000 people of 18 tribes. The Navajo population base was small, ill-defined, and perhaps consisted of those living in the Phoenix Metropolitan Area. Our study represented almost 150,000 Navajos in a relatively defined geographical area.

The present survey may suffer from incomplete case ascertainment because of "silent" and undiagnosed AMIs. In the Framingham study, about one-fourth of AMIs were silent or undiagnosed at the time of occurrence.[29] Among Israeli government employees, almost 40 per cent of AMIs were unrecognized.[30] Truly silent AMIs constituted about half the cases in each of these studies, while the others had symptoms undiagnosed or misdiagnosed at the time because they were atypical. Navajos do not appear to have a high threshold for medical care utilization in general, and it is possible that PHS physicians underdiagnosed AMI because (at least in the past) they had a low index of suspicion. Even if "silent" AMI occurred two or three times more frequently among Navajo as compared to the US population, AMI attack rates must be less than one-fourth or one-fifth of those seen in the general population (Table 2).

We chose patients with GB disease as a comparison group because cholelithiasis and cholecystitis often require hospitalization, occur in a middle-aged and older age group, and are traditionally common diseases among Southwestern Indians.[31,32] While there may be confounding risk factors between AMI and GB disease, the fact is that GB disease has been a very frequent problem and AMI a rare problem for Navajos. The traditional (i.e., last 75 years) lifestyle was associated with GB disease but not AMI. Therefore, it seemed reasonable to ascertain how age- and sex-matched AMI and GB patients differ. However, AMI patients are more likely to be hospitalized than GB patients and, thus, our comparison group probably overrepresents those with severe GB disease (Berkson's fallacy) rather than representing the real distribution of severity. Diabetes and hypertension, as might be expected, were more frequent in AMI patients. Obesity was not significantly associated with AMI (23 per cent versus 16 per cent) overall, but it was a definite risk factor in men (20 per cent versus 7 per cent).

The data are consistent with the hypothesis that Navajos are relatively resistant to coronary heart disease, and that a large increase in occurrence has yet to take place. Interestingly, we found that the incidence of diagnosed AMI appears to be increasing in women, but this observation is based on a small number of cases.

Our findings are at variance with clinical impressions of Navajo Area Indian Health Service (IHS) physicians in recent years. This may mean that, although some increase in frequency

TABLE 3—Risk Factors in Pairs of Acute Myocardial Infarction and Gallbladder Disease Patients Matched for Sex and Age Group

Risk Factor	No. of Pairs	Case +* Control +	Case + Control −	Case − Control +	Case − Control −	Relative Risk	95% Confidence Interval
Hypertension	144	16	36	5	87	7.2	2.8–25.1
Diabetes	144	9	37	16	82	2.3	1.2– 4.6
Obesity	144	6	27	17	94	1.6	0.8– 3.2
Smoking	144	5	23	18	98	1.3	—
Alcohol Abuse	134	5	20	17	92	1.2	—
Nontraditional Employment**	109	7	20	16	66	1.2	—
Stroke	83	0	5	6	72	0.8	—

*Factor present in both members of AMI-GB patient pair.
**Known regular employment (or retired from such employment) as opposed to traditional Navajo livelihood.

of AMI has occurred, the major part (except among women) took place before our study period. Other factors may include overestimation of rates because of low initial expectations among physicians; or a more "liberal" use of the diagnosis, unconfirmed by strict diagnostic criteria, in the last few years.

Kunitz and Temkin-Greener studied hospital discharge diagnoses of AMI among Navajos during 1972–78,** and observed no increase in occurrence over those seven years. They recorded 82 diagnoses in the three years (1976–78) that overlap with our study period; we found 67 diagnoses and 48 confirmed cases. However, Kunitz and Temkin-Greener included Albuquerque and Phoenix IHS Area statistics in their analyses. It is quite possible that some (or most) Navajos treated in those areas are included in our denominators. If so, we have underestimated the number of confirmed AMI cases for those three years by about 18 per cent (15/82), an important but not excessive "leakage".

Regarding major risk factors, Navajos and other Southwestern Indians have a low prevalence of cigarette smoking,[11,12] and serum cholesterol levels less than comparable Caucasians or Blacks,[13–16] but they also have a high prevalence of diabetes[17–20] and obesity.[12,19–20] Physical activity, life stresses, and behavior patterns have not been evaluated. Genetic factors that modulate obesity, serum cholesterol, diabetes, and hypertension are likely superimposed upon other unspecified genetic influences on coronary atherosclerosis. Environmental conditions and lifestyle in this century have promoted the expression of diabetes in these genetically homogenous populations, especially in the Pima of central Arizona. Diabetes in the Pima appears to be associated with an increased risk of ischemic heart disease,[10] as is the case among the Navajo in this study. Environmental and lifestyle changes may well lead to an increased incidence of AMI in Navajo Indians in the future since the clinical expression of ischemic heart disease takes place only after 20 or more years of atherogenesis.

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