

Cardiovascular Risk Factor Status Of An Old Order Mennonite Community

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Background: The Old Order Mennonites are members of rural farming communities whose religious and cultural traditions pervade their dietary and health practices. These cloistered Christian communities often present special challenges to primary care physicians unfamiliar with the Mennonite way of life. Anecdotal descriptions of Mennonite customs suggest heightened risk for cardiovascular disease because of a dairy and meat-based diet and a lack of utilization of the traditional health care system.

Methods: With approval from the church bishop, households from a New York State Mennonite community were interviewed about personal and family history of cardiovascular disease, knowledge of dietary cardiovascular risk factors, and personal awareness of their cardiovascular risk factor status. A standardized Saturated Fat/Cholesterol Avoidance Scale was used to assess qualitatively the community's traditional diet. Blood pressures and total serum cholesterol levels were measured in all willing participants.

Results: Two hundred fifty interviews were completed. A significant difference was found between the cholesterol level of the men (181 mg/dL) and the women (192 mg/dL). When compared with the general population, the Mennonite men had significantly lower total serum cholesterol levels and systolic and diastolic blood pressures. Only 8 percent of the study population had been previously screened for serum cholesterol. One-third of the population older than 55 years had a personal history of either myocardial infarction or stroke. The study population's score on the Saturated Fat/Cholesterol Avoidance Scale indicated a diet higher in saturated fat and cholesterol than that of other study populations.

Conclusions: Our findings indicate a significant lack of preventive health care practices, minimal avoidance of dietary cardiovascular risk factors, and a significant difference between men's and women's cardiovascular risk factor status in this Old Order Mennonite population. (J Am Board Fam Pract 1993; 6:225-231.)

Yates County, New York, is home to a prosperous community of Old Order Mennonites who migrated from Lancaster County, Pennsylvania, in search of farmland for themselves and their children. Established in the early 1970s, this community has grown to 144 families with more than 800 persons.¹ The recent development of this community accounts for the relatively young average age of the adults. These people possess deep religious and cultural traditions dating back to the Anabaptist movement of sixteenth century Europe. Out of this greatly persecuted movement

were born the Amish, Hutterites, Brethren, and Old Order Mennonite cultures.²

The Old Order Mennonites share a purposefully stoic lifestyle reflecting their sixteenth century roots. Most members of the community live on small, single-family dairy farms where large families are the norm. Within these families the father is responsible for running the farm and managing the finances while the mother takes care of the children and the housework. Transportation is by horse-drawn carriage, and contact with the outside world is limited because radios, television, and public education are shunned. Abstinence from alcohol and tobacco products are characteristic of this community. The children are educated through the eighth grade in a church-operated one-room school house and then are usually expected to work on the family farm until they marry. While the Old Order Mennonite church doctrine of passive nonresistance forbids military service, law suits, voting, and

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holding public office, these people also refuse social welfare programs and government handouts, preferring to rely on one another when needs arise.

The Old Order Mennonites present several challenges to the physician responsible for their health care. First, their diet, although not previously characterized, is thought to be high in saturated fat and cholesterol. Their traditional agrarian diet is founded upon an abundant supply of eggs, red meat, milk, and cheese. The traditional methods of preparing these foods (i.e., frying and baking in animal fat, butter, and lard) only add to the amount of saturated fat and cholesterol in their diet. Second, because of their isolation from much of society, one wonders how much of the current information about the dangers of a diet high in cholesterol and saturated fat is actually reaching them. Third, the medical literature suggests that preventive medicine is a concept that does not have strong support in similar cloistered communities.^{3,4} The Mennonite belief that subscribing to health insurance represents a lack of trust in God is thought to limit their timely use of medical care.⁴ When they do seek care, it is often from midwives, chiropractors, and those in other alternative forms of medicine. Often the only time they have contact with physicians is in the emergency department. As a result, physicians have limited opportunity to counsel this population about preventing cardiovascular disease through dietary modifications and screening programs. The aim of our study was to define which cardiovascular risk factors are inherent in this population to aid the primary care physicians who are responsible for their care.

Methods

Initial approval for a study of cardiovascular risk factors was obtained through contact with the church bishop of the Old Order Mennonite community in Yates County, New York. Following this contact, letters were sent to each of the 144 households of the community. The letter, which explained the purpose of our study and requested their participation, was followed by a home visit, at which time consent was obtained for an interview with the adults (aged 16 years and older) of the household. Participants were told that they would receive a report of their results, including blood pressure and cholesterol levels, at the com-

pletion of the study. Participants were also supplied with a list of community physicians available for follow-up care.

The interviews elicited information about saturated fat and cholesterol intake, knowledge of good dietary practices, and presence of a family history of heart disease. We also measured the participants' blood pressures and total serum cholesterol levels if they were willing.

To characterize the household's saturated fat and cholesterol avoidance behavior, the Saturated Fat/Cholesterol Avoidance Scale was used.⁵ This scale included six questions evaluating the degree to which participants avoided sources of saturated fat and cholesterol in their diet. These items inquired how often skin was removed from chicken (chickskin), the type of milk most often used (milktype), the type of hamburger meat eaten most often (beeffat), the type of fat used most often in cooking (fattoil), how often fat was trimmed from meat (trimfat), and the number of eggs eaten per month (eggs/mo). Each question was followed by a series of responses that were scored from 0.0 to 1.0 with a score of 1.0 representing a high degree of dietary saturated fat and cholesterol avoidance. The questions were asked of the primary person who prepared the meals and planned the menus. The internal consistency of the composite scale was measured by implementing Cronbach's alpha,⁶ which provided a conservative estimate of reliability. Alpha coefficients were computed using the program "Reliability" in SPSS,⁷ which allowed selection of items from the scale that made independent contributions to its internal consistency.

Another 17 questions were created by our group to assess the participants' general knowledge of cardiovascular risk factors and their personal cardiovascular risk factor statuses. These questions asked whether the participants were aware of their personal cholesterol level and blood pressure status and whether they had a personal or family history of cardiovascular disease. A positive family history for cardiovascular disease was defined as the following: any grandparents, parents, or siblings who had (1) a myocardial infarction before the age of 60 years, (2) a stroke before the age of 60 years, (3) an unexplained sudden death before the age of 60 years, or (4) a history of diagnosed hypertension.

Two blood pressures were taken, one at 5 minutes into the interview and one at the conclusion of the session, by two independent interviewers. A venous blood sample was taken from each consenting participant, placed on ice, and delivered to a laboratory approved by the New York State Department of Health. The samples were then centrifuged to separate sera and assayed within 24 hours to measure total cholesterol by enzymatic colorimetric methods using CAP-approved standards (Total Serum Cholesterol Assay Kit, DCL used in CIBA/Corning Express 550 Analyzer). Total cholesterol was selected as the most efficient screening test for an asymptomatic population and avoided the problems of obtaining fasting blood samples.

Data were analyzed using the Statistical Package for the Social Sciences (SPSS).⁷ The chi-square test was used for comparison of proportions. Listwise correlations were calculated and the Student t-test was used to calculate relations between means.

Results

Of the 144 households contacted, 122 chose to participate in the study, representing 85 percent of the homes in the community. In total, 250 adults participated in our study with 225 (90 percent) electing to have their serum cholesterol level tested. The total study population (including children) was 679, with an average household containing 5.7 people. Ninety-six percent of the households were made up of a simple nuclear family. Distribution of this population by age and sex is displayed in Table 1. Ninety-eight percent

of the households ate 90 percent or more of their meals at home. The mother of the household was the primary person responsible for cooking the meals and planning the menu in all of the households surveyed except for two, which contained bachelors living alone.

The mean composite household score for all six items of the Saturated Fat/Cholesterol Avoidance Scale was 2.16 (SD = 1.0). Individual means for each question were as follows: chickskin = 0.458, milktype = 0.168, beefat = 0.160, fatoil = 0.492, trimfat = 0.668, eggs/mo = 0.210 (Figure 1). Cronbach's alpha value (0.4164) for the scale was comparable with those previously used in the analysis of group characteristics and implies good internal consistency.⁷

The average total serum cholesterol values and their distribution by sex are displayed in Table 1. There was a statistically significant difference ($P < 0.05$) between men and women in their average total cholesterol levels. Distribution of average cholesterol values by age and comparison with national means as determined by the National Health and Nutrition Examination Survey (NHANES) II are displayed in Table 2. Eleven percent of the participants had cholesterol levels greater than or equal to 240 mg/dL. The average age of those with cholesterol levels greater than 240 mg/dL was 34 years. Though not statistically significant, a negative correlation (Pearson $r = -0.10$) was found between the primary food preparer's Saturated Fat/Cholesterol Avoidance Scale score and total serum cholesterol level. There was no significant correlation between the subjects' age and their Saturated Fat/Cholesterol Avoidance Scale scores. There was a significant correlation ($P < 0.001$) between a man's age and his total serum cholesterol (Pearson $r = 0.32$). No such correlation was found among the women in the study.

There were no significant differences between the respective average systolic (120 and 116 mmHg) and diastolic (75 and 73 mmHg) blood pressures of the men and women. Distribution of blood pressures by age and comparison with national means as determined by the NHANES II are shown in Table 3. A statistically significant ($P < 0.001$) positive correlation was found between both systolic (Pearson $r = 0.32$) and diastolic (Pearson $r = 0.31$) blood pressures with age.

Table 1. Mean Total Cholesterol Levels and Percentage of Old Order Mennonite Community with Cholesterol Levels > 200 and > 240 mg/dL by Sex.

	All	Women	Men
Age in years (SD)	32.5 (10.5)	32.2 (10.4)	32.7 (10.7)
Cholesterol in mg/dL (SD)	186.5 (40.6)	192.4 (43.3)	181.3* (43.3)
Cholesterol level > 200 mg/dL (%)	34.2	38.0	30.8
Cholesterol level > 240 mg/dL (%)	10.7	13.3	8.3
Number of respondents	225	105	120

* $P < 0.05$. Men's mean cholesterol is significantly lower than women's mean cholesterol.

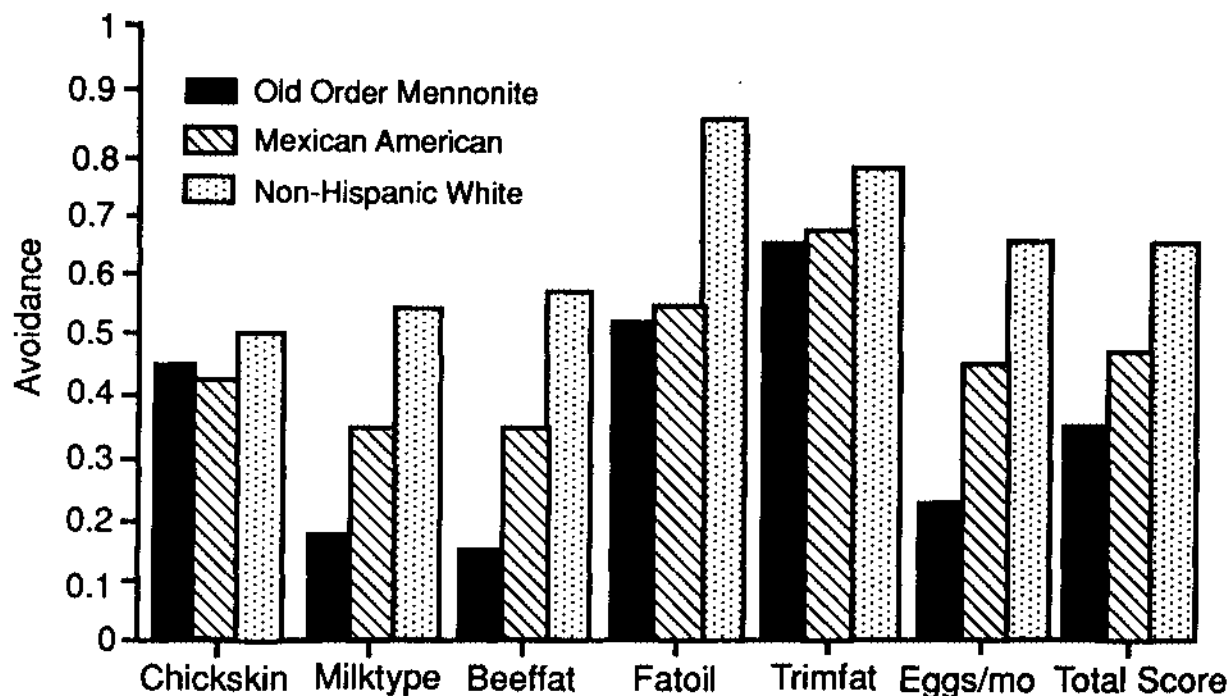


Figure 1. Saturated Fat/Cholesterol Avoidance Scale: comparison of mean scores for three populations. Scores for individual items ranged from 0 to 1 with 1 = maximum fat avoidance. Scale taken from Knapp, et al.⁵

When asked whether they thought that what they eat could affect their chances of developing heart disease, 75 percent of the participants answered yes. Three-fourths of the population also believed that the amount of saturated fat in one's diet was important in preventing heart disease. Ninety percent of the population correctly recognized that dairy products were a dietary source high in cholesterol. When asked which dietary

elements (sugars, proteins, vitamins, or fats) contributed most to the development of heart disease, 90 percent correctly chose fats. Eighty-eight percent correctly chose "baked without skin" as the healthiest way to prepare chicken (rather than fried or baked with skin). There was no statistically significant difference in total knowledge score between men and women. Among women there was a statistically significant ($P < 0.01$) positive correlation (Pearson $r = 0.23$) between an individual's total Saturated Fat/Cholesterol Avoidance Scale score and total knowledge score.

Only 8 percent of the study participants had had their serum cholesterol previously measured, whereas only 6 percent of the population knew their approximate cholesterol level. Fifty-two percent of the participants had had their blood pressure measured within the previous year. Women ($n = 80$) were more likely than men ($n = 50$) to have had their blood pressure measured within the past year, and this finding was statistically significant ($P < 0.001$). Nine percent of the population admitted to having had hypertension previously diagnosed by a physician. Of the 91 percent who denied ever having high blood pressure diagnosed by a physician, 12 new cases of hypertension (diastolic pressure > 89 mmHg or

Table 2. Comparison of Mean Total Serum Cholesterol Values (mg/dl.) by Age and Sex, Mennonites versus NHANES II Subjects.*

Age (years)	Women		Men	
	Mennonite	NHANES II	Mennonite	NHANES II
20-24	191 (21) [†]	184	166 [‡] (20)	180
25-34	195 (51)	192	179 [‡] (56)	199
35-44	181 [‡] (18)	207	195 [‡] (24)	217
20-44	191 (90)	190	181 [‡] (100)	191

*National Health and Nutrition Examination Survey II 1976-80. A nonprobability sample of the noninstitutionalized US population aged 6 months to 74 years old. Sample size = 27,801; interviewed = 25,286; examined = 20,322.

[†]Numbers in parentheses are numbers of respondents.

[‡] $P < 0.05$ Mennonite mean significantly lower than NHANES II mean.

Table 3. Comparison of Mean Diastolic and Systolic Blood Pressure Values (mg/dL) by Age and Sex, Mennonites versus NHANES* II Subjects.

Age (years)	Women		Men	
	Mennonite	NHANES II	Mennonite	NHANES II
Diastolic Blood Pressure Values				
18-24	65.7 [†] (25) [‡]	70.0	71.8 [†] (24)	76.0
25-34	70.5 (58)	73.0	74.8 [†] (60)	79.0
35-44	80.7 (20)	77.0	77.7* (24)	82.0
Systolic Blood Pressure Values				
18-24	110.2 (25)	111	121.7 (24)	124
25-34	110.9 (58)	112	120.6 [†] (60)	125
35-44	123.3 (20)	119	120.1 [†] (24)	126

*National Health and Nutrition Examination Survey 1976-80. A nonprobability sample of the noninstitutionalized US population aged 6 months to 74 years old. Sample size = 27,801; interviewed = 25,286; examined = 20,322.

[†] $P < 0.05$ Mennonite mean significantly lower than NHANES II mean.

[‡]Numbers in parentheses are numbers of respondents.

systolic > 139 mmHg) were discovered during this study. Eight of the 12 previously undiagnosed cases were in men. In total, 14 percent of the population either had hypertension previously diagnosed or were found by our study to be hypertensive.

Fifty-five percent of the study population had a positive family history of cardiovascular disease. Of these, 18 percent had a positive family history of myocardial infarction before age 60 years, 7 percent had a positive family history of stroke before age 60 years, and 48 percent had a positive family history of hypertension. Finally, 5 (30 percent) of the 17 persons in the study who were 55 years old or older admitted to having a personal history of myocardial infarct or stroke. Although this small population limits the statistical significance of this finding, it is notable that all 5 were men.

Discussion

In planning our interview, we decided to direct the questions composing the Saturated Fat/Cholesterol Avoidance Scale to the primary person who prepared the meals and planned the menus. Because this person was the mother in virtually all the households interviewed, we used her score to represent the entire family's avoidance behavior. With 98 percent of the population eating more than 90 percent of their meals at home, we believe that

this measure of saturated fat and cholesterol avoidance behavior is accurate for this study population.

A comparison of the average Saturated Fat/Cholesterol Avoidance Scale score of the Old Order Mennonite population with those of a Mexican-American barrio population and a non-Hispanic white suburban population as presented by the San Antonio Heart Study can be found in Figure 1. Of the populations previously studied using the Saturated Fat/Cholesterol Avoidance Scale, the Old Order Mennonites scored lower on almost every item of the scale and had the lowest cumulative score overall. The saturated fat-cholesterol avoidance behavior in the Mennonite diet was lowest in the categories of type of milk used (milktype), leanness of beef consumed (beef fat), and number of eggs eaten per month (eggs/mo). The low scores in these categories could be due in part to the ease in which these foods are available in this agrarian culture. Low cholesterol-avoidance behavior could also represent either a lack of knowledge of dietary cardiovascular risk factors or simply the failure of that knowledge to make an impact on their traditional food preparation and consumption patterns. From our results it would appear that both of these factors played some role in their dietary practices. There was a positive correlation between the women's total Saturated Fat/Cholesterol Avoidance Scale score and their total knowledge score, indicating that knowledge of healthy dietary practices does make some impact on eating habits.

As a group the population failed to put into practice what they knew about dietary cardiovascular risk factors. For example, although 88 percent of the population knew that the healthiest way to prepare chicken was without the skin, only 18 percent regularly removed the skin. Although 90 percent knew that dairy products are a high source of cholesterol, 78 percent drank whole milk and 66 percent ate one or more eggs per day. These findings suggest that educating this population about dietary cardiovascular risk factors could be effective in improving their dietary habits. Their traditional values and practices, however, might limit the practical implementation of dietary cardiovascular risk factor knowledge.

Because low scores on the Saturated Fat/Cholesterol Avoidance Scale have correlated with elevations in total serum cholesterol,⁵ we ex-

pected higher than average serum cholesterol levels in this Mennonite population. Although not statistically significant, we did find an inverse relation between the mother's Saturated Fat/Cholesterol Avoidance Scale scores and her total serum cholesterol levels (Pearson $r = -0.10$). In comparison with the normal distribution of serum cholesterol as established by the NHANES II study (Table 2), the Mennonite women's cholesterol levels were comparable with their non-Mennonite counterparts.⁸ There was a significant difference within the Mennonite population between the men and women, however, with the men's serum cholesterol levels averaging approximately 11 mg/dL below that of the women. This finding is interesting considering that premenopausal women's cholesterol levels in the general population are typically lower than their male counterparts.⁸ Additionally, the Mennonite men's serum cholesterol levels were significantly lower than their non-Mennonite counterparts in the NHANES II study (Table 2).⁸

Table 3 also shows that the Mennonite men's systolic and diastolic blood pressures were significantly lower than those of the men in the NHANES II study.⁹ These findings were not duplicated for the Mennonite women. A previous study of mortality rates among the Old Order Amish (a culture comparable with the Old Order Mennonites) reported that Amish men had lower rates of cardiovascular disease than their non-Amish counterparts, a finding not duplicated among Amish women.¹⁰ These results suggest that there is an advantage in terms of these cardiovascular risk factors to being a male in such a cloistered farming community as the Mennonites. As physical exercise is one factor implicated in reducing total serum cholesterol levels,¹¹ one possible explanation for this difference could be the amount of physical activity in which the Mennonite men engage through their farming activities compared with the less physically active work required of the Mennonite women or the average non-Mennonite man. An undetermined genetic factor could also contribute to these findings considering the relative genetic isolation of these people.

Only 8 percent of the study population had had their cholesterol measured previous to our study, in contrast to both the 46 percent found in a national survey in 1986¹² and the 24 percent found in another rural farming community.¹³ In

comparison with the 83.7 percent of nonmetropolitan adults who had had their blood pressure measured within the last year,¹⁴ only 52 percent of our study group had had their blood pressures measured in the last year, with most of these being women. Mennonite men were also twice as likely as women to have undiagnosed hypertension. Because it is not unusual for women in this population to bear up to 13 children in their lifetime, they were much more likely to be under the care of a physician or nurse-midwife at any time. As a result, the men would be the ones most affected by the lack of access to cholesterol and hypertension screening.

Although the rate of hypertension (14 percent) for the total community was comparable with that found in other nonmetropolitan communities, the rate of cardiovascular disease (2 percent) was significantly lower.¹⁴ This finding is most likely attributed to the relatively young age of the population as a whole (i.e., mean age 32.7 years). In contrast, more than one-half of the population had a positive family history of heart disease by our criteria. Additionally, almost one-half of the population had a positive family history of hypertension. Because our study shows that roughly one-third of the persons 55 aged years and older in this community had a personal history of either a myocardial infarction or stroke, the need becomes apparent for further longitudinal study of cardiovascular risk factor status in this community as it ages.

Conclusion

We believe that our study of this Old Order Mennonite community reveals (1) inadequate dietary cardiovascular risk factor avoidance behavior, (2) a lack of preventive medical care, and (3) significant differences between men and women in this population regarding cardiovascular risk factor status. Additional study of cardiovascular disease risk factors is needed for this community, especially in regard to serum high-density lipoprotein, low-density lipoprotein, and triglyceride levels. More thorough quantification of their dietary composition, physical activity, lean body mass, and other factors is currently being addressed by our group in a follow-up study.

Cholesterol and hypertension screening programs could be valuable to such populations as the Old Order Mennonites, as their dietary practices

and limited access to the health care system might predispose them to cardiovascular disease. Our study should also alert physicians working with similar populations to recognize that providing effective, timely health care could require special efforts to reach these individuals instead of waiting for them to seek medical attention at a more critical time. Because physician access to cloistered communities such as the Old Order Mennonites is somewhat limited, however, new strategies should be considered to reach this unique community.

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