

**THE PREVALENCE OF CARDIOVASCULAR DISEASE AND ASSOCIATED
RISK FACTORS IN THE OLD ORDER AMISH IN NORTHERN INDIANA:
A PRELIMINARY STUDY**

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ABSTRACT

Background: The Amish are a culturally distinct religious sect who are the fastest growing rural group in the U.S. Little is known about their prevalence of cardiovascular disease (CVD) and its risk factors of the Amish. The purpose of this study was to determine the prevalence rates, risk factors, and types of treatments used to prevent and treat CVD among a sample of the adult Amish in northern Indiana.

Methods: A randomized retrospective chart review (n = 200) from a primary healthcare clinic in a large Amish settlement was conducted. Descriptive statistics were used to determine prevalence rates of CVD, risk factors, and types of medical and alternative health treatments. Prevalence rates were compared to white prevalence rates of the American Heart Association (AHA) 2009.

Results: The overall CVD prevalence was higher among Amish men (n = 105) and women (n = 95) compared to white men and women (38.1% and 44.2% vs. 37.2% and 35%, respectively). Regarding CVD risk factors, there was a higher prevalence of hyperlipidemia when compared to AHA prevalence rates (22.9% and 24.2% vs. 16.1% and 18.2%) but a lower prevalence of Type II diabetes mellitus (4.8% and 5.3% vs. 6.7% and 6.0%) and smoking (9.5% and 2.1% vs. 24% and 20%). Obesity was prevalent with 73.7% of males (n = 19) and 100% (n = 11) of women were overweight or obese. An additional finding was the high prevalence of depression in both Amish genders compared to rural Americans (19.0% and 22.1% vs. 6.1% both genders) and anxiety (11.4% and 14.7% vs. 3.6% and 6.6%). The Amish use a wide variety of vitamins and herbal remedies along with prescription medications to prevent and treat CVD.

Conclusion: CVD and its associated risk factors are a concerning health problem in the Amish of northern Indiana.

INTRODUCTION

The Old Order Amish are a culturally distinct rural population in which little is known about cardiovascular disease (CVD) prevalence. The Old Order Amish (hereafter referred to as the Amish) are the fastest growing rural group in the U.S. (Armer & Radina, 2002) and at their current growth rate of 5% a year, the Amish population is expected to double in 14 years (Elizabethtown College, 2010). There are 427 different settlements located in over 28 states and

in Ontario, Canada. The Amish population in the U.S. totals over 249,000, with two thirds of all Amish living in Pennsylvania, Ohio and Indiana (Elizabethtown College, 2010).

The Amish are a closed religious community who live in church districts closely monitored by the local bishop and community members. They typically do not continue formal schooling after the eighth grade, and those educated in parochial schools do not study science. Using natural remedies and seeking care from non-traditional healthcare providers are common in this culture. The Amish are more likely to use alternative and complementary medicine as a first attempt at resolving health issues and only seek modern healthcare if initial attempts fail (Graham & Cates, 2006). They often fall victim to fantastic claims of natural cures by alternative drug companies who target this culture's desire to remain as 'natural' as possible (Schwartz, 2002). The Amish lifestyle is different from other rural Americans due to their resistance to using technology, their reliance on God's will above all things, and their use of old world health knowledge and remedies (Graham & Cates, 2006; Kraybill, 2003). As a result of these unique beliefs, behaviors and health care practices, the prevalence of CVD amongst the Amish may not be accurately reflected in national statistics.

The Amish resist the use of technology, and do not have electricity or telephones in their homes. They must rely on telephone booths placed in central locations close to other Amish homes to call for assistance. Their primary modes of local transportation are the bicycle and the horse and buggy. The 'English' (their emic term for the non-Amish) assist with travel if longer distances are required. The Amish do not obtain commercial health insurance and all health care costs are paid in cash by the family. If the costs are more than a single family can afford, the Amish church district(s) assist with the medical bills. Paying all CVD expenses out-of-pocket can have a significant impact on the health, as well as the finances, of the Amish community. Improving health and preventing long term complications of CVD can significantly impact the entire Amish community.

Little is known about Amish CVD prevalence compared to other rural Americans. Furthermore, there are no known studies that have specifically examined Amish cardiovascular preventative healthcare practices or use of alternative treatments to prevent or treat CVD. There are no known published cardiovascular research studies of the Amish in northern Indiana. Therefore, the primary purpose of this closed retrospective chart review was to determine the prevalence of CVD and its associated risk factors in a sample of Amish in northern Indiana. A secondary aim was to describe the types of medical and alternative treatments used to prevent and treat CVD.

LITERATURE REVIEW

To date, most of the published research on the Amish and CVD has been the result of large cross-sectional descriptive studies carried out at the Amish Research Clinic in Strasburg, PA (Bielak et al., 2008; Hsueh, Mitchell, Aburomia et al., 2000; Mitchell et al., 2008). The Amish have been an attractive population for genetic studies of CVD. They are similar culturally, intermarriage within the culture is the norm, and their genealogical lines are documented back to the early 1700's (Platte et al., 2003). They have large families, and have presumably avoided most of the modern day conveniences that have increased cardiovascular risk factors. Genetic studies have led to the identification of specific genes that influence blood pressure (Hsueh, Mitchell, Schneider et al., 2000; McArdle et al., 2007; McArdle et al., 2008) and obesity (Hsueh, Mitchell, Schneider, 2001; Platte et al., 2003; Rampersaud, Mitchell et al.,

2008; Steinle et al., 2002; Steinle et al., 2005; Wang et al., 2009). In addition, these primary studies have found that lipid levels (Pollin et al., 2008; Pollin et al., 2004, Roberts et al., 2007), prolonged QT intervals (Post, Shen et al., 2007) and arterial calcification (Post, Bielak et al., 2007; Rampersaud, Bielak, et al., 2008; Shen et al., 2007) are heritable in the Amish. Bielak et al. (2008) compared Amish from Lancaster County, PA, with a non-Hispanic white population and found that the Amish, after adjusting for cardiovascular risk factors, had a 66% greater coronary artery calcification than their comparison group.

Only two studies published in the last ten years examined CVD and its risk factors in the Amish outside of Pennsylvania. Bassett et al. (2004) characterized the level of physical activity in the Amish of Ontario, Canada, and found the population, who were primarily farmers, was very active and had lower rates of being overweight or obese than the general population. Ferketich et al. (2008) determined tobacco use in the Amish of Holmes County, Ohio, was significantly lower than the general population as confirmed with salivary cotinine levels (17.6% vs. 38.8%).

Research examining the Amish and CVD is needed to better understand this distinct settlement of Amish in northern Indiana. Previous studies have concentrated on the Amish in Lancaster County, PA and have primarily examined how genetics affect CVD or its risk factors. There is no known research of the Amish located outside of Pennsylvania that has explored the prevalence of CVD and its risk factors. It is unknown if the Amish in Indiana differ significantly from the Amish in Pennsylvania. Furthermore, the types of traditional or alternative treatments used to prevent/treat CVD have not been explored. Therefore, the purpose of this retrospective study was to determine the prevalence rate of CVD and its associated risk factors among a sample of Amish in northern Indiana. In addition, the researchers explored the types of medical and alternative treatments used to prevent and treat CVD.

METHODOLOGY

Sample

This retrospective patient chart review was conducted at a primary health clinic in a large Amish settlement in northern Indiana. Charts were selected for analysis if the client was Amish, 18 years or older and was seen within the past two years at the clinic. Two hundred charts were selected randomly using an electronically generated random number table. If a chart was designated that did not meet the inclusion criteria, it was replaced and the next chart alphabetically was pulled until all inclusion criteria were met.

Procedure

Approval was obtained from the appropriate Institutional Review Board and the Medical Director of the clinic prior to data collection. All data was collected in December 2008. Demographic data collected from the charts included: age; gender; type of employment; self-reported family history of CVD; tobacco use; presence of hypertension, anxiety, depression, hyperlipidemia, angina, peripheral vascular disease, congestive heart failure (CHF), and coronary artery disease; history of myocardial infarction, cerebrovascular accidents (CVA), and types of cardiovascular surgeries. Height and weight were recorded if both were located in the chart. All medications and treatments noted in the chart (traditional and alternative) were recorded. Race

and education data were not collected since all Amish in this northern Indiana region are Caucasian and typically have an eighth grade education. Information was self-reported or documented by the health care provider. For classification purposes, CVD included those with a history of CVA, CHF, hypertension and/or hyperlipidemia, while coronary heart disease (CHD) included those with coronary arterial calcification and/or a myocardial infarction.

Data was collected using an instrument developed by the principal investigator and was later entered into an Excel spreadsheet. Data was validated by a comparison between the chart data and the spreadsheet to ensure accuracy. Data was analyzed using descriptive statistics to quantify the demographic data, prevalence of CVD and its risk factors, and the types and quantity of treatments utilized.

RESULTS

The sampling of 200 charts included 105 males and 95 females ages 18 to 89 years (Table 1). The mean age of males was 45.35 ± 18.34 years and females 47.83 ± 20.14 years. The males were primarily employed in manufacturing (33.3%) and small business (40.0%), with only 16.2% with farming as their source of income. The women were mostly homemakers (74.7%).

Table 1. Demographic Data

		n = 105		n = 95	
Age (Yr)		45.35	(SD 18.34)	47.83	(SD 20.14)
Employment *					
	Manufacturing	35	33.3%	5	5.3%
	Sm Business	42	40.0%	15	15.8%
	Homemaker	0	0.0%	71	74.7%
	Agriculture	17	16.2%	1	1.1%
	Teaching	0	0.0%	2	2.1%
	Construction	10	9.5%	0	0.0%
	Religion	3	2.9%	0	0.0%

Body mass index (BMI) was only calculated on 30 of the charts (19 males and 11 females) due to absence of height measurements in the remaining charts (Table 2). The BMI for the males ranged from 17.3 to 42.3 kg/m² with a mean of 28.8 kg/m², and the females ranged from 25.1 to 43.2 kg/m² with a mean of 35.1 kg/m². Compared to the World Health Organization guidelines (2009) only 26.3% (5/19) of the males were considered underweight or of normal weight (BMI ≤ 24.9), while 26.3% (5/19) were considered overweight (BMI ≥ 25 and < 30) and 47.4% (9/19) were considered obese (BMI ≥ 30). The BMI rates for females were even greater, with no females at normal weight, 27.3% (3/11) were overweight and 72.7% (8/11) were considered obese.

Table 2. Body Mass Index Characteristics

	Male	Female
BMI: kg / m ² (n = 30)	(n = 19)	(n = 11)
RANGE	17.3 - 42.3	25.1 - 43.2
MEAN BMI	28.8	35.1
MEDIAN BMI	29.5	36.1
NORMAL WT	5 (26.3%)	0
OVERWEIGHT	5 (26.3%)	3 (27.3%)
OBESE	9 (47.4%)	8 (72.7%)

BMI = Body Mass Index

A family history of CVD was noted in 34.5% of the charts, hypertension was documented in 32.5% and type II diabetes mellitus in 29.5%. Only 6.5% of the charts documented a family history of hyperlipidemia and another 6% noted a family history of depression, which did not correspond to the actual prevalence rates noted in this sample.

When comparing males to females, CVD was in 38.1% and 44.2% (CI 34.2% to 47.8%) of the charts respectively, while CHD prevalence was only noted in 1.9% and 4.2% (CI 0.6% to 5.4%). CVA's were documented in 4.8% of the males and 5.3% of the females (CI 2.0% to 8.0%) while hypertension was noted in 22.9% and 31.6% (CI 20.8% to 33.2%), respectively. Hyperlipidemia was reported in 22.9% of the males and 24.2% of the females (CI 17.6% to 29.4%), although CHF rates (1.0% and 3.2%, CI 0.1% to 3.9%) and myocardial infarction rates (1.9% and 4.2%, CI 0.6% to 5.4%) were much lower. Type II diabetes mellitus was found to be at 4.8% prevalence in males and 5.3% in females (CI 2.0% to 8.0%), while hypothyroidism was found in 8.6% and 20% (CI 9.2% to 18.8%), respectively. Smoking rates were low at 9.5% (males) and 2.1% (females) (CI 2.7% to 9.3%). Interestingly, depression was found in 19% of males and 22.1% of females (CI 14.9% to 26.1%), while anxiety was diagnosed in 11.4% and 14.7% (CI 8.3% to 17.7%), respectively. The preliminary prevalence data and comparative statistics are located in Table 3. It is unclear if the differences noted between this population and the national data are significant. Various cardiovascular surgeries were noted, including two coronary artery bypass grafts, two pacemakers, and a total of six valve replacements in three patients. In addition, one person had been diagnosed with Marfan's Syndrome, one with Von Willebrand's Disease and one with Factor V gene mutation.

This sample of Amish used many low cost prescription and alternative medications. The males used 53 different prescription drugs and 73 different alternative drugs, while the females used 67 different prescription medications and 84 different alternative medications. Hydrochlorothiazide was the most common anti-hypertensive used by both genders, while both groups also commonly used aspirin for cardiac prophylaxis and levothyroxine sodium for hypothyroidism. Many vitamins and herbal supplements were documented without specific purposes noted. The most common taken by males were vitamin C, saw palmetto, flaxseed oil, "Body Balance" and calcium, while the women most commonly used calcium, vitamin E, a multivitamin, glucosamine and flaxseed oil.

Table 3 – Comparison of Amish CVD and CV Risk Factor Prevalence Rates to the National Average (Whites > 20 years)

	Men			Women		
	Amish (n=105) %	National Average %	Difference	Women (n=95) %	National Average %	Difference
CVD						
CVD	38.1	37.2	+0.9	44.2	35.0	+9.2
CHD	1.9	9.4	-7.5	4.2	6.0	-1.8
CHF	1.0	2.8	-1.8	3.2	2.1	+1.1
MI	1.9	9.4	-7.5	4.2	6.0	-1.8
CVA	4.8	2.4	+2.4	5.3	2.7	+2.6
HTN	22.9	32.5	-9.6	31.6	31.4	+0.2
CV Risk Factors						
Smoker	9.5	24.0	-14.5	2.1	20.0	-17.9
Hypothyroidism	8.6	5.1	+3.5	20.0	5.1	+14.9
Hyperlipidemia	22.9	16.1	+6.8	24.2	18.2	+6.0
DM II	4.8	6.7	-1.9	5.3	6.0	-0.7
Depression	19.0	6.1	+12.9	22.1	6.1	+16.0
Anxiety	11.4	3.6	+7.8	14.7	6.6	+8.1

CVD = Cardiovascular Disease
 CHD = Coronary Artery Disease
 CVA = Cerebrovascular Accident
 CV = Cardiovascular
 CHF = Congestive Heart Failure

CHF = Congestive Heart Failure
 DM II = Diabetes Mellitus Type II
 HTN = Hypertension
 MI = Myocardial Infarction

DISCUSSION

The age and gender distribution of this sample were reflective of the general Amish population, which typically has a larger distribution of younger individuals (attributed to large families) and a smaller distribution of those over the age of 65 when compared to the non-Amish population (Hostetler, 1993). With only 16.2% of this sample working in agriculture, which was in contrast to Bassett's sample (2004) from Ontario, it indicated that not all Amish communities are homogenous.

As evidenced in Table 3, this study showed CVD is a health concern in the Amish of northern Indiana. When compared to the 2009 AHA prevalence rates for whites greater than 20 years old, the Amish CVD prevalence was found to be higher in males by 0.9% and females by 9.2%. CHD was found to be lower than national rates (-7.3% in males and -1.8% in females), but this may be due to a lack of receiving expensive diagnostic testing that would accurately diagnose this specific disease. Without medical insurance to pay for diagnostic tests, expensive testing which may be considered routine, is cost prohibitive in the Amish. Additionally, lower than comparative rates of known myocardial infarctions (-7.5% males, -1.8% females) may have represented a lack of diagnosis with electrocardiograms or other diagnostic tests, but may have indicated the possibility that the Amish do not arrive at the hospital in time to be treated for myocardial infarctions. Their distance from a local hospital, their lack of quick transportation, and lack of easily accessible telephones to call for emergency transport would delay help in reaching someone experiencing signs of an infarct.

Depression and anxiety rates in this sample were much higher than comparison samples. With depression rates of 19% in males and 22.1% in females, this was much higher than Probst et al. (2006) study that reported the prevalence rate of depression in rural Americans at 6.11%. Anxiety was significantly higher at 11.4% (males) and 14.7% (females) than Wittchen (2002) reported as a 3.6% prevalence in males and 6.6% in females; while Young et al. (2008) further confirmed that the prevalence rate of persistent anxiety at 4.7%. It is unknown why the depression rates and anxiety levels are so high. These results were collected at the beginning of the economic downturn in the U.S. and this study location was later to have some of the highest unemployment rates in the nation. These results may have indicated the anxiety and concern over possible changes in the economy.

Study findings indicated that hyperlipidemia was a health concern, but few Amish take prescriptive medications to lower their lipid levels. Even though the prevalence was higher than national rates by 6.8% in males and 6.0% in females, only 4.5% of the Amish were taking prescribed lipid lowering agents. Alternative treatments, such as red yeast rice, grape seed, flax seed oil and green tea, which have been reported anecdotally to improve cholesterol levels, were used, but there was little documentation of laboratory follow-up to ensure improvement of lipid levels. Documentation was noted of nutritional education that was culturally acceptable, which included instructions on eating more fresh fruits and vegetables, increasing fiber and whole grains, and decreasing oil and butter use when cooking. This education was directed at those with hyperlipidemia and those who were considered overweight.

The Amish self-prescribe many alternative herbal medications. Their medical charts did not indicate the intended purpose for taking the herb, and little is known about the effects of them in the body or its interaction with other prescription or alternative medications. These alternatives ranged from common vitamins to more obscure treatments heavily promoted by alternative drug companies. Many Amish choose 'natural' remedies over man-made remedies.

Smoking prevalence was much lower in the Amish than in the general population (Centers for Disease Control, 2009). While this finding may be limited with only having self-reported data, it is consistent with findings from Holmes County, OH (Ferketich et al., 2008) which confirmed low tobacco use. The low prevalence of smoking may indicate a strict *Ordnung* against the use of tobacco.

The Amish of northern Indiana are primarily employed in small business and manufacturing, not in agriculture, such as in Ontario, Canada (Bassett et al., 2004) which may indicate a less active lifestyle. This shift in type of employment and increased BMI may indicate

the Amish of northern Indiana may be more progressive and acculturated to the “English” lifestyle than those who live in more traditional Amish communities, which may lead to increased cardiovascular risk compared to traditional settlements.

CONCLUSION

This preliminary study is unique as prevalence rates of CVD and its associated risk factors have not been previously reported in the Amish setting in northern Indiana Amish. This study indicated that CVD and its risk factors are health concerns. This group of Amish self-prescribed many alternative treatments, in addition to using a wide range of prescription medications. While the literature identified gaps in what is known about CVD prevalence data, particularly of the Amish of northern Indiana, this preliminary study begins to fill the gap and provides direction for research needed in the future.

The knowledge of this population’s cardiovascular health care practices is limited by the data found in the retrospective chart review and that some data was self-reported. In addition, since BMI was only calculable on a small number of charts, this data needs confirmation with a larger sample size. While many alternative treatments were noted in the chart, the anticipated effects of these alternatives were not noted. In addition, it is not known if the Amish perceive CVD as a health problem in their culture. The results of this study indicate the need for further qualitative and quantitative studies to thoroughly investigate the cardiovascular health promotion practices of the Amish of northern Indiana. This knowledge can lead to the development of culturally specific tailored interventions to improve the cardiovascular health of this Amish population.

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