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Cardiac Risk Factors between Farmers and Non-Farmers

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ABSTRACT

Prokosch AJ, Dalleck LC, Pettitt RW. Cardiac Risk Factors between Farmers and Non-Farmers. **JEPonline** 2011;14(3):91-100. The purpose of this study is to compare the cardiovascular risk factors between farmers and non-farmers in a rural southwestern Minnesota county. Fifty participants (age = 59.8 ± 11.12 yrs), of which 27 were farmers (22 males, 5 females) and 23 were non-farmers (12 males, 11 females), were recruited from Redwood County, Minnesota. All participants completed a health history questionnaire based on their current occupation (farmer vs. non-farmer), age, gender, history of heart disease, family history of heart disease, cigarette smoking, physical activity level, and a stress intensity level. Baseline measurements included resting heart rate (HR), blood pressure (BP), anthropometric (height, weight, and waist circumference), fasting blood lipid, and fasting blood glucose. Independent t-tests revealed no significant difference for any of the cardiovascular risk factors between farmers and non-farmers. Dyslipidemia (76.9%), physical inactivity (51.8%), and obesity (40.7%) were the most prevalent risk factors in farmers. The non-farmers had a higher prevalence in obesity (56.5%), physical inactivity (52.1%), and elevated blood pressure (34.7%). Although there were no significant differences in any of the risk factors between the farmers and the non-farmers, lifestyle modification is recommended because the overall prevalence of CVD risk factors is high for both groups.

Key Words: BMI, Cholesterol, Diabetes, Prevention, Farming

INTRODUCTION

Numerous studies have assessed the comparison of cardiovascular risk factors between men and women, especially between farm and non-farm groups throughout the United States and across the world (3,5,7,8,10,14,15,17,19-22). It is well-known that cardiovascular disease (CVD) is the leading cause of death and morbidity in the United States (1). The burdens of CVD and the prevalence of CVD risk factors both continue to increase as the American population ages (5,8,10-16,18). There are numerous modifiable risk factors that contribute to CVD including, but not limited to, hypertension, cigarette smoking and exposure to tobacco smoke, diabetes mellitus, obesity, physical inactivity, and elevated low-density lipoprotein (LDL).

McCarty and colleagues (10) concluded that the prevalence of risk factors for atherosclerosis is high in rural women who are considered at high risk for future CVD. According to Pomrehn et al. (15), farmers and farm workers, as an occupational group, have been included in several studies of CVD because the physical activity required for their work might protect them from ischemic heart disease. On the other hand, the Pomrehn study (15) showed that fasting serum cholesterol, triglycerides, and very-low density lipoprotein cholesterol measured high in farmers compared to non-farmers. For certain, farming is considered one of the top 10 most stressful and hazardous occupations in the United States (16). Some stressors that associate with farming may include changes in market and crop prices, unpredicted weather, finances, illness as well as injury that may occur on the job. The relationship of stress and CVD has not been fully studied merely because most studies occur with individuals who are currently at risk for CVD.

When under stress, there is an increase in heart rate (HR), hypertension, and a greater risk of CVD. The National Institute for Occupational Safety and Health reported that laborers and farm owners had the highest rate of deaths due to stress-related conditions like CVD and hypertension (2). Currently, the second most leading cause of death in Minnesota is heart disease, with cancer leading (11,12). According to the Minnesota Department of Health, approximately 139,000 Minnesotans have coronary heart disease (CHD) or angina pectoris (12). The 2007 Burden Report from the Minnesota Department of Health indicated that the heart disease mortality rate for Minnesota was 141 per 100,000 persons in 2005 and 232 per 100,000 persons in the United States in 2004 (13). However, overall mortality rates for Minnesota are still lower than the entire United States.

Individuals in the farming occupation are vital to the American society, and should be studied more for their contributions to the community and area. For this reason, the primary purpose of this study was to compare the cardiac risk factors between farmers and non-farmers in a Minnesota southwest rural community.

METHODS

Subjects

A total of 50 subjects (age = 59.8 ± 11.12 yrs), of which 27 were farmers (22 males, 5 females) and 23 were non-farmers (12 males, 11 females), were recruited from Redwood County, MN by way of poster and newspaper advertisements. All individuals were eligible for inclusion in the study, provided they were currently healthy, between the ages of 40 and 80 yrs, and had a farming operation in Redwood County, MN. All participants provided their written informed consent and completed a health history questionnaire. All procedures were approved by the Minnesota State University Institutional Review Board.

Procedures

Three days of testing the participants for CVD risk factors occurred during February and March of 2010. All participants were tested between 8:00 a.m. and 12:00 p.m. After the participants set an appointment time and date via email or by telephone with an investigator, they were provided specific procedural instructions (including fasting for 9 to 12 hrs prior to testing). They were also informed to refrain from caffeine, food, beverages with caloric value as well as refraining from any form of strenuous exercise prior to testing. All participants were permitted to consume water *ad libitum.* After informed consent was given, all participants completed a health history questionnaire that included questions based on their current full-time occupation if they were a farmer (e.g., crop, livestock, dairy, production, etc.) or non-farmer (business, education, medical profession, clerical, etc.), as well as age, gender, history of heart disease, family history of heart disease, cigarette smoking, and level of physical activity. An additional stress intensity level questionnaire was also administered. After all initial paper work was completed, resting heart rate (HR), blood pressure (BP), anthropometric data, fasting blood glucose, and fasting lipids were measured. Measurements were performed by the same trained investigator at baseline to prevent variability.

Health History Questionnaire. All participants were asked to provide current full-time occupation in relation to farmer or non-farmer. They were also asked to provide their age on the day of their individual testing. The questionnaire was based on self-history of heart disease, family history of heart disease, cigarette smoking, and physical activity level were all assessed by yes/no responses according to published guidelines (1).

Stress Intensity Level Questionnaire. All participants were asked to complete a 29-item questionnaire for a composite score to determine overall stress intensity. Levels ranged from Low, Medium, to High. Stress intensity ratings followed the format 0 = not at all, 1 = somewhat, 2 = moderate 3 = severe. Total stress intensity levels were High = 30 and higher, Medium = 15-29 and Low = 14 and under. This questionnaire, used by the Extension Service of Minnesota for the Web-based Educational Series, was adapted from Holmes and Rahe's Social Adjustment Rating Scale (6, 18).

Anthropometric Measurements. Participant body mass was determined by measuring weight to the nearest 0.1 kg using an electronic scale (Taylor Precision Products, New Mexico, USA). Participant height was determined by measuring height to the nearest cm using a standard tape measure. Waist circumference measurements were acquired via a spring-loaded tape measure (Creative Health Products, Ann Arbor, MI). A horizontal measurement was obtained at the narrowest circumference of the torso, at an anatomical point above the umbilicus and falling beneath the xiphoid process. Waist circumference measurements were repeated until two were within ±1 cm.

Physiological Variables. ACSM guidelines were followed for obtaining resting heart rate and resting blood pressure (1). Participants were seated quietly for five minutes in a chair with arms rested and relaxed at heart level. Blood pressure was measured twice on the left arm brachial artery with the use of a sphygomomanomter. Measurements were separated by one minute and the mean of the two measurements was recorded. Fasting blood lipids and blood glucose tests were performed last. Prior to the day of testing, participants were instructed to fast for 12 hrs and also to refrain from exercise, caffeine, and smoking the actual day of testing. Directly before testing, participants were requested to wash their hands in warm, soapy water. After a 10-min rest in the seated position, the right index finger was wiped clean with an alcohol swab and permitted to air dry. The skin on the side of the right index finger was punctured using a disposable lancet and 40 µl of blood was collected into a heparin-coated capillary tube. Blood was then immediately dispensed onto test cassettes for analysis with a LDX Cholestech analyzer, which measured total cholesterol, high density lipoprotein (HDL)

cholesterol, low density lipoprotein (LDL) cholesterol, triglycerides, and blood glucose. Fasting blood lipid and blood glucose measures obtain via the Cholestech LDX have been reported to correlate significantly (P = 0.05) with traditional clinical-based methods (13).

Statistical Analyses

All analyses were performed using SPSS, Version 12.0 (SPSS, Inc, Chicago, IL). Measures of centrality and spread are presented as mean ± SD. Independent t-tests were performed to compare cardiovascular disease risk factors between farmers and non-farmers. A Mann-Whitney U was used for composite stress scores (famer v. non-farmer). The probability of committing a Type I error was established at P = 0.05 for all statistical analyses.

RESULTS

Risk factor data (mean ± SD) from farmers and non-farmers are reported in Table 1. Independent t-tests revealed no significant difference for any cardiovascular risk factors between farmers and non-farmers. BMI, waist circumference, and BP values tended to be lower in farmers vs. non-farmers, although non-farmers had a superior lipid profile when compared to farmers. The lipid profile and blood glucose data was reported as n = 26 for farmers due to inadequate amount of blood for the sample.

Table 1. Participant characteristics (mean ± SD).

Variable	Farmers (n = 27)	Non-Farmers (n = 23)	t	P-Value
Resting Heart Rate (bpm)	64.48 ± 7.83	65.91±5.62	-.73	.47
SBP (mmHg)	128.11±8.95	132.96±14.63	-1.44	.16
DBP (mmHg)	79.67±7.73	80.43±6.49	-.38	.71
Height (cm)	176.86±10.29	173.84±10.31	1.03	.31
Weight (kg)	90.89±19.22	92.05±18.57	-.22	.83
BMI (kg/m²)	28.82±4.52	30.13±3.91	-1.09	.28
Waist circumference (cm)	95±12.7	97.7±12.4	-.75	.46
***Total Cholesterol (mg/dL)**	205.30±34.16	191.08±31.20	1.51	.14
***LDL (mg/dL)**	127.23±26.84	113.69±24.43	1.84	.07
***HDL (mg/dL)**	47.30±13.36	48.65±16.19	-.32	.75
***Triglycerides (mg/dL)**	144.88±68.04	146.13±62.27	-.07	.95
***Blood Glucose (mg/dL)**	97.80±15.29	96.95±21.69	.16	.87

*n = 26 for farmers; Participant unable to provide enough blood for sample.

The prevalence of all CVD risk factors by group is presented in Table 2. The top three most prevalent risk factors for farmers were dyslipidemia (76.9%), physical inactivity (51.8%), and obesity (40.7%). The top three risk factors for non-farmers were obesity (56.5%), physical inactivity (52.1%), and elevated blood pressure (34.7%).

Table 2. Prevalence of cardiovascular disease individual risk factors by number of components.

Number of Total Positive Risk Factors	n	Elevated Blood Pressure	Obesity	Sedentary	Smoker	Family History	Personal History	*Impaired Blood Lipid Profile	*Impaired Blood Glucose
Farmers	**27**	n = 5 % = 18.5	n = 11 % = 40.7	n = 14 % = 51.8	n = 1 % = 4.0	n = 6 % = 22.2	n = 0 % = 0	n = 20 % = 76.9	n = 7 % = 26.9
Non	**23**	n = 8 % = 34.7	n = 13 % = 56.5	n = 12 % = 52.1	n = 2 % = 9.0	n = 7 % = 30.4	n = 6 % = 26.1	n = 6 % = 26.1	n = 4 % = 17.3

***n = 26 for farmers; participant unable to provide enough blood for sample

The stress intensity level frequency for composite stress score between farmers and non-farmers indicated no market difference which is represented in Figures 1 and 2.

Farming involves complex physical work, long hours, and a variety of stressors that may reflect on their overall health. Some stressors may include financial difficulties (unreliable prices, crop loss, debt, etc.), weather changing, machinery breakdown, and/or conflicts within the farming operation itself. Few studies have reported the physiological effects of stress on farmers, however some have reported on the lifestyles and overall health status of farmers for a specific location (3,5,7,9,10,19, 21,22).

Figure 1. Farmer-Stress Intensity Level Frequency represented by a percentage.

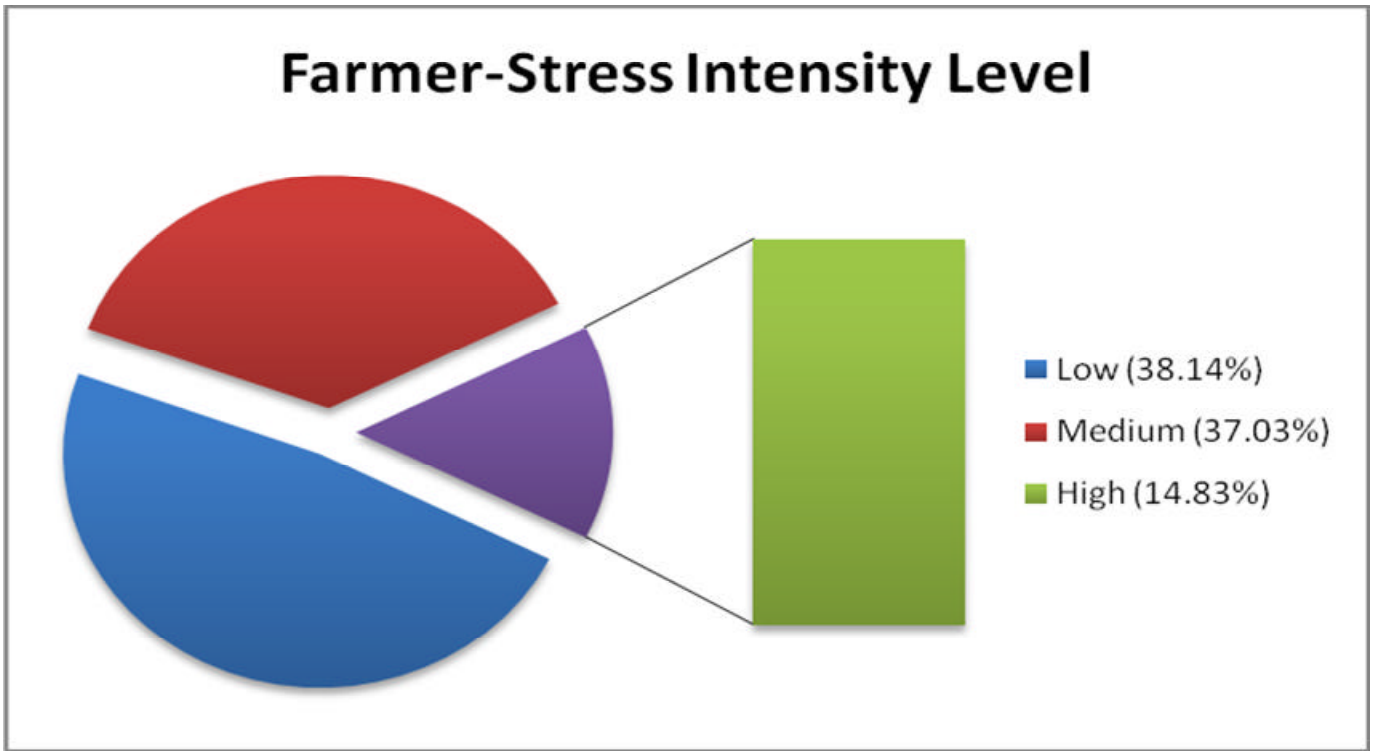
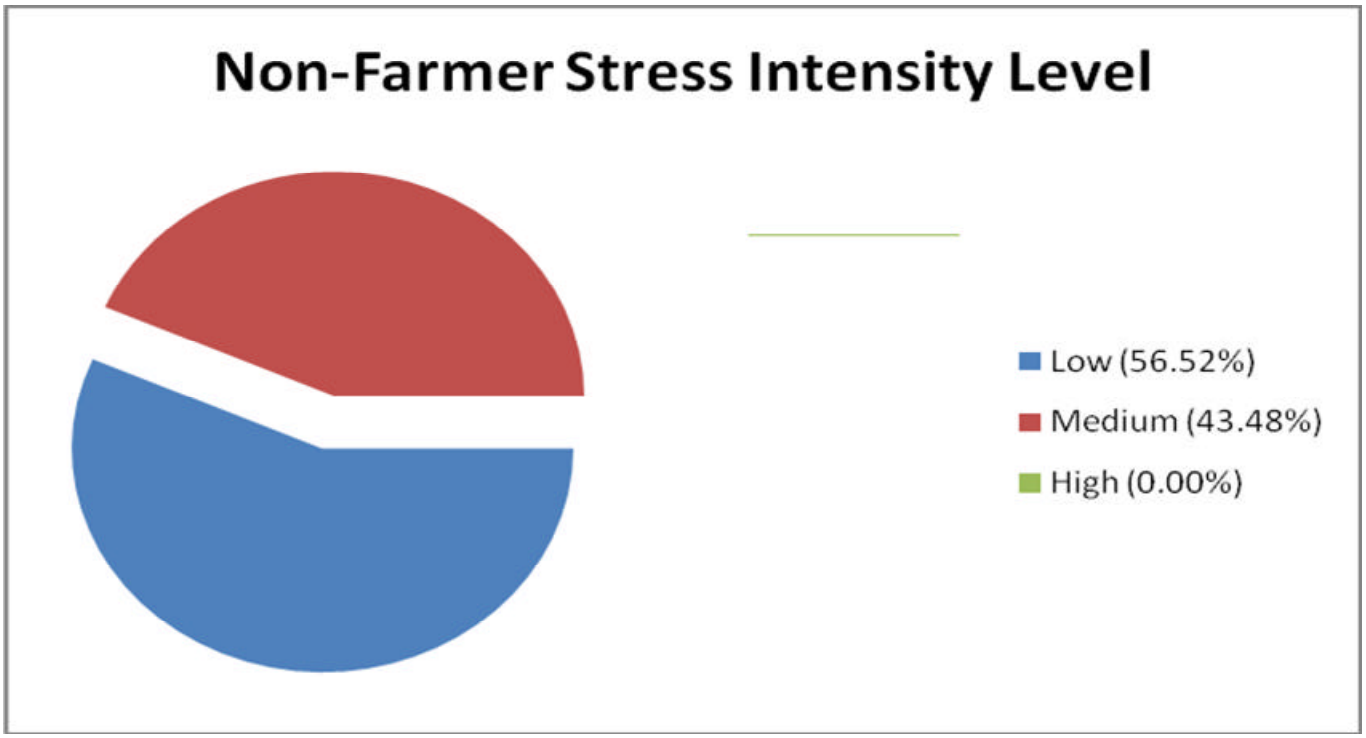


Figure 2. Non-Farmer Stress Intensity Level Frequency represented by a percentage.



DISCUSSION

The purpose of this study was to compare the CVD risk factors between farmers and non-farmers in a rural community in southwestern Minnesota. The main finding of this study was that there is no significant difference in the cardiovascular risk factors between farmers and non-farmers. Overall, there are similarities in the baseline characteristics as well as multiple CVD risk factors that were present in both groups. These results are comparable to other studies that reported similar findings. The Li et al. (8) study found the overall proportions of individual and multiple cardiovascular risk factors for hypertension, high cholesterol, and obesity were 26.5%, 30.4%, and 23.3%, respectively. Furthermore, Lizer et al. (9) reported the prevalence of symptoms and diagnoses for older Illinois farmers included hyperlipidemia (41.5%) and hypertension (34.7%).

The failure to find significant differences between the farmers and the non-farmers could be explained by similarities in physical activity habits. Fourteen of the 27 (51.8%) farmers and 12 of the 23 (52.1%) non-farmers reported not participating in at least 30 min of moderate intensity physical activity at least 3 days per week during the prior 3 months of the study. This explanation of physical inactivity could be due to the time of this study, that is, the non-farming season of February and March. Studies have indicated that the farming occupation typically requires a greater amount of physical activity than that of the non-farming occupations (3,7,9,15,19). However, Stiernström et al. (19) found that 12% of farmers compared to 18% of non-farmers reported participating in moderate to vigorous activity. The finding in the present study, in both groups, of less than half the population meeting current physical activity guidelines is comparable to what has been reported by others (1,11,12).

It is estimated that approximately 107 million Americans have blood cholesterol levels exceeding 200 mg/dL (1). Our findings (53%) are comparable to the national prevalence for hypercholesterolemia

and findings that have also been reported elsewhere (10,14,15,17,20,22). Interestingly, Jenkins et al. (7) indicated that farming is protective for hypertension and hypercholesterolemia and the prevalence of both was lower in farmers compared to non-farmers (7). Additionally, in 2005, it was indicated that approximately 33% of adults in Minnesota reported having high blood cholesterol. This is significantly lower than the adults in the study cohort with 53% (11). The advancements in technology and evolution of machinery could be an explanation. Over the past decade, there have been numerous improvements in the farming operations including the development of larger machinery to cover more acres and the development of auto steering systems which reduces operator fatigue.

There are several similarities and differences when comparing the prevalence of CVD risk factors of this study to Minnesota as well as the United States. The national findings specify that that approximately two-thirds of American adults are classified as overweight and about 32% are obese (1). The Minnesota Department of Health showed 61% of adults as being overweight, including 24% who were obese (11). The present study showed that 48% of participants were obese as evidenced by a BMI =30 kg/m^2, which is higher than both national and state-level prevalence rates (1,11,12). Hypertension prevalence is about 25% of individuals 18 and older in the United States compared to 22% of Minnesota adults (1). Our study indicated 26% of the participants had elevated BP while McCarty et al. (10) showed similar data with their study of rural farm women versus non-farm women from Wisconsin with 27.5% elevated blood pressure (10). The prevalence of self-reported heart disease among adults in Minnesota was 3.7% (angina or coronary heart disease) and 3.4% having heart attacks in 2006 (11,12). Family history of heart disease and self-reported heart disease in this study were 26% and 12%, respectively. These results may suggest the explanation for the higher prevalence of CVD risk factors for the volunteers who participated. Additionally, previously published studies collected their data as early as 1964 until recently in 2007. This may also suggest the differences and similarities of present study compared to the previous research (3,5,7-10,15,17,19-21).

This study incorporates a small proportion of potential participants from the total farming population in Redwood County. The Farm Credit Bureau of Redwood Falls identified 982 operational farmers in Redwood County, making this the largest concentration of a farming population in Minnesota. This study may help determine the CVD risk factors for a small population sample in a rural community, and it might indicate how health information and education is needed for lifestyle modification to help reduce the future risks of CVDs. Restricted access to health services in the rural area may be an explanation for the higher prevalence of CVD risk factors. This rural community may have limited resources or information readily available. However, future community-based programs could be implemented for those who are at risk for cardiovascular diseases. Area clinical practice and public health campaigns could also be encouraged to focus on increased physical activity, decreased fat intake, as well as obesity prevention. For example, the Heart of New Ulm project is making efforts in prevention and intervention of the incidences of myocardial infarction (4).

There are several limitations to consider. Participants were volunteers which may include selection bias. Future research should examine CVD risk factors at different times of the season. For example, it would be interesting to compare CVD risk factors during the farming season (April and November) and the non-farming season. Additionally, farmers and non-farmers could be matched by the number of years they had worked or have lived the typical farming lifestyle or occupied a farming operation.

CONCLUSIONS

In summary, there was no statistically significant difference of cardiovascular risk factors between farmers and non-farmers. All cardiovascular risk factors are highly prevalent in Minnesota, and the majority of the risk factors are modifiable and efforts of lifestyle modification could be implemented. Reasons may be unclear why there are multiple risk factors present in both farmers and non-farmers in this particular area. The data suggest that a greater amount of attention regarding CVD risk factors should be applied to the community for both farmers and non-farmers.

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