STRONG HEART STUDY

INVESTIGATING CARDIOVASCULAR DISEASE IN AMERICAN INDIANS

newsletter

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Working with Scientists Across the Country Helps the Strong Heart Study Benefit our Communities

Because the Strong Heart Study (SHS) has been ongoing for eighteen years, it has a tremendous collection of data from the blood and urine samples that were collected, from questionnaires, and from the DNA samples that were stored. As you know, SHS studies are focused on understanding heart disease and its risk factors. There are high rates of diabetes and obesity in our communities; therefore, there is a special emphasis on these two risk factors. The Institutional Review Boards ("IRB's", that monitor and control research among human participants) and the tribal councils review our study plans before each new exam; and those of you who are participants are given lots of information about what tests we are going to do when you sign the consent form.

Sometimes we have to cooperate with other well-known, qualified scientists who are able to do tests that we are not able to do in our own laboratories and clinics. For example, scientists that we work with at Children's National Medical Center (CNMC) in Washington, DC are able to check for very slight changes in the DNA. The system they developed is able to test hundreds of samples in a very short period of time and uses only an extremely small amount of DNA, so much more research can be done on the SHS samples before they are used up. The plans for the current exams, which were presented to the tribes and the IRB's, included tests for a number of genes such as PPAR, IL-6, thrombospondin, lymphotoxin and TLR-4 genes. These names are complicated but basically they are genes that make proteins we think are important in understanding what causes diabetes and makes hardening of the arteries happen.

The scientists at CNMC are also working on other projects. One project studies athletes before and after training and conditioning. They hope to find changes in the way certain genes work that might pinpoint what genes control energy use and metabolism. They are especially interested in a gene called PGC-1 alpha that works with a gene called PPAR that has already been studied in SHS. They also have discovered two genes called TPD and BCL-6 that have effects on how cells grow and multiply (and sometimes cause blockages in our arteries). They found one change in the TPD gene that makes people more resistant to their own insulin and also develop high blood fats. The BCL gene seems to help control energy metabolism in these athletes. The CNMC investigators will now work with us to test these same genes in the Strong Heart Study samples. Trying to find the really important ways that our bodies control metabolism and energy is a slow process. Sometimes investigators will find a gene or marker in one population, but it doesn't seem to be important in another population. If investigators can work together to test their findings in different populations, it can advance knowledge faster and further. This will bring us closer to the goal of these genetic studies, which is to find ways to predict who will become resistant to insulin and develop diabetes, who will have high blood fat levels and who is more likely to become overweight; or maybe even lead to medicines or other treatments to prevent these problems. By working with other researchers in this way, the SHS makes better use of the data and samples to develop better prevention and treatment methods sooner.

SHS

Second Exam of Family Study in Full Swing

The second examination of the family study cohort is going strong. As of March 1st all three centers were ahead of schedule in recruitment for the follow-up examination. The Arizona center had examined 315 participants, Oklahoma had examined 352 participants, and the Dakota center had examined 415 participants. As with any large project, there are always difficulties as written study protocol, new equipment, new staff, extensive training, and required certification are put to the test. Arizona had to overcome a blown gasket on their new van that carries the ultrasound equipment for imaging atherosclerosis in the arteries of your neck and legs. The Dakotas have had to endure the seasonal rain that makes many roads in the reservation difficult, if not impossible, to use. Oklahoma has struggled to identify clinic space for the Strong Heart Study exam facilities. In spite of these challenges, Strong Heart Study staff have found ways to overcome all of these issues and have found the study participants eager to be part of this multi-center project that is defining the burden of cardiovascular disease in Indian Country and identifying how these data may be used to improve the health of American Indians. Even the central chemistry laboratory at Penn Medical Laboratory in Washington D.C. and the ECG laboratory at Cornell School of Medicine in New York had to overcome equipment failures. Penn Medical Laboratory has struggled with new equipment for analyzing blood samples that has not met the high standards required for the Strong Heart Study samples. This has delayed the samples for an extended period while the manufacturer tries to bring the equipment up to acceptable performance. Samples remain stored and safe throughout this delay which now appears to be resolved. Results from delayed assays are expected in the next few weeks. Malfunctioning ECG equipment caused some of the first exams of the new cycle to be lost because the storage mechanism was not working properly. This problem has also been resolved with minimal loss. As these issues are resolved, the Strong Heart Study staff looks forward to seeing the Strong Heart Family Study participants and updating them on their health. Hope to see you soon!

SHS

Impact of Obesity on Cardiac Geometry and Function in a Population of Adolescents: The Strong Heart Study

In adults, obesity causes enlargement of the heart and increase weight of the heart muscle (called hypertrophy) and negatively affects the ability of heart to increase blood supply to the body in response to stresses. In obese adults, the heart may also be less able to relax after pumping blood into the arterial tree. Whether or not these abnormalities also affect the heart of overweight or obese adolescents had not been well-documented in population-based samples.

To address this question, of particular importance in view of rising body weight in all segments of the U.S. population and in most countries around the world, we used measures of the size and function of the heart obtained from echocardiograms - - tests performed using high-frequency sound aimed at the heart using a probe positioned on the surface of the chest. Participants aged 15-20 years in the 4th Strong Heart Study examination, the Strong Heart Family study, had echocardiograms performed and the findings related to their body weight in relation to their height. Among 460 adolescent participants in the 4th Strong Heart

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Impact of Obesity on Cardiac Geometry

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Study examination, 26% had normal body weight by U.S national guidelines, 25% were overweight and 49% were obese. Obese, but not overweight, adolescent Strong Heart Study participants were more likely to have increased blood glucose, diabetes, abnormal levels of cholesterol and other fats in the blood and high blood pressure. When combined, these abnormalities lead to diagnosis of a recently-described condition called the "metabolic syndrome" that has been shown to predict cardiovascular events in older SHS participants and in other populations.

Among adolescent participants in the Strong Heart Study, both overweight and obese adolescents had greater heart weight than the group with normal body weight. In overweight adolescents the increased cardiac weight was adequate to sustain the increased cardiac workload associated with high body weight; in obese adolescents the increased cardiac weight was out of proportion with that needed to pump blood to the body and was also associated with clear abnormalities in both the pumping function of the heart and its ability to relax after each heart beat.

This study demonstrated that at an early age - - among individuals aged 15 to 20 years - - obesity, and to a lesser extent overweight may negatively influence both aspects of body metabolism and the size and function of the heart. These findings suggest that early interventions during childhood and adolescence to reduce the prevalence of overweight and prevent the transition from overweight to overt obesity may help to reduce the frequency of diabetes and other severe metabolic alterations and to avoid unfavorable changes in cardiac structure and function, which have in turn been demonstrated to be strong predictors of cardiovascular events and death.

SHS

Control Your Diabetes by Eating Healthy

Evidence from previous studies suggests that glycemic control (maintaining normal or near-normal blood sugar levels) is fundamental to the management of diabetes and its importance in reducing or delaying the complications of diabetes. Many of the bad effects of diabetes on the body are due to a slow process of ever increasing damage to tiny blood vessels and nerves in various organs and body parts such as the eyes, kidneys, heart, hands, and feet. Such slow injury to the blood supply and the nerve supply of each of these body parts too often leads to blindness, sores that will not heal, amputations of feet or legs, the need for kidney dialysis and kidney transplants, and heart failure or heart attacks.

Strong Heart Study investigators recently found that a diet *low* in total fat, saturated fat (e.g., butter and lard), and protein (e.g., meats of all kinds), but *high* in fiber and carbohydrates (e.g., whole wheat bread, cereal, fruits and vegetables) is associated with *good* glycemic control in diabetic American Indians. What does this mean for diabetic American Indians? This study suggests that if you consume foods that are lower in total fat, saturated fat, and protein, and higher in fiber and carbohydrates, your blood sugar is more likely to stay at a more normal, healthy level. Avoiding high levels of sugar in the blood will slow down or stop the complicated process of deterioration that high blood sugar causes in the tiny blood vessels and nerves that each body part depends on to work normally. So, to avoid the terrible complications of diabetes, eat more whole grain cereals, fruits, and vegetables. You can learn much more about healthy eating by asking your healthcare provider, contacting the American Diabetes Association for information on good foods and meal plans, or by visiting with your local IHS Diabetes Educator.

SHS

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Prehypertension, Diabetes, and Cardiovascular Disease Risk

Recently, the federal blood pressure guidelines were revised and now include a new risk category named "prehypertension". "Normal" blood pressure (BP) is now defined as a BP less than 120/80 (systolic BP/diastolic BP), while BPs of 140/90 or higher continue to be classified as high blood pressure or "hypertension". The range of BPs in between normal and high blood pressure (i.e., 120/80 to 139/89) is now classified as prehypertension. Although it is well known that elevated blood pressure is related to the development of cardiovascular disease (CVD, the leading cause of death in the US), little is known about the development of new cases of heart disease and stroke in people falling in this recently-defined category of BP and whether such adverse effects of prehypertension are greater in diabetics than in non-diabetics. Data from the Strong Heart Study were recently analyzed and published in an attempt to answer these questions.

In brief, the results (see Table below) showed that the prevalence of prehypertension is high among American Indians and that it is higher in those with diabetes. Importantly, prehypertension was found to be associated with an increase in risk for heart disease and stroke in both diabetic and non-diabetic American Indians, and the increase in risk is greater in people with diabetes. This may be due in part to the fact that a large proportion of prehypertensive people develop hypertension in a short period of time. This is an important public health issue because of the high rate of disease and death related to hypertension, especially in populations with a high prevalence of diabetes such as Native American communities. To combat or reverse prehypertension, lifestyle changes are needed, such as increases in physical activity, improvements in diet, and reductions in body weight. In prehypertensive diabetic people, drug treatment for blood pressure control may be indicated for the prevention of heart disease and stroke. SHS

	Rate (%)
By diabetes and prehypertension status	
non-diabetic with normal blood pressure	7.3
non-diabetic with prehypertension	13.1
diabetic with normal blood pressure	17.8
diabetic with prehypertension	23.8

Table. Rates of CVD by blood pressure and diabetes status.