Two Michigan high school students develop screening tools to detect lung and heart disease

October 21 2014

Two Michigan high school students, sisters Ilina and Medha Krishen, have developed screening tools using electronic stethoscopes to detect lung and heart disease. The sisters will present their findings at CHEST 2014 in Austin, Texas next week. Credit: The Krishen family

Two Michigan high school students, sisters Ilina and Medha Krishen, have developed screening tools using electronic stethoscopes to detect lung and heart disease. The sisters will present their findings at CHEST 2014 in Austin, Texas next week.

Ilina Krishen became aware of the dangers of smoking and chemical air pollution when she saw the effects of lung disease on family members. Curious to find a way to detect early lung damage in people exposed to noxious air pollutants, Ilina, a high school senior at Port Huron Northern High School in Michigan, developed a screening mechanism using an electronic stethoscope. An electronic stethoscope overcomes the problem of low sound levels by electronically amplifying body sounds, using an electromagnetic diaphragm that captures the diaphragm movement as an electrical signal.

Ilina recruited 16 smokers, 13 firefighters, and 25 nonsmokers for her test. The electronic stethoscope recorded one breath cycle from each volunteer. Frequency peaks were used to analyze the frequency distribution of breath sounds. Differences of peaks above 125 Hz were analyzed.

Ilina found that the number of peaks was significantly higher in smokers and firefighters, even if the firefighters were nonsmokers. She realized that although firefighters wear protective masks when fighting fires, they often do not wear masks when making a second check of the building after the fire is out. "The firefighters are exposed to many poisonous chemicals that remain in the air after the fire has gone out," said Ilina. "Screening with an electronic stethoscope may be able to detect early changes in lung function in individuals without symptoms of lung disease ."

Medha Krishen, Ilina's sister and a junior at Port Huron Northern High School, also presented a study that used an electronic stethoscope to screen student athletes for hypertrophic cardiomyopathy (HCM).

Medha studied 13 individuals: 10 with a normal cardiac sports physical and three with a diagnosis for HCM. Heart sounds were recorded in 5-second periods while the athletes were lying down, standing, and after exercise. Frequency peaks of a frequency amplitude plot were analyzed. Studies showed a significant difference in the distribution of frequency peaks in the two groups between the lying down position and after exercise. Normal athletes showed a lower percentage of peaks above 131 Hz after exercise, while the athletes at risk showed a rise in frequency peaks following exercise.

"When I was in fifth grade, a family friend died after exercise, and I always wanted to learn more about how to prevent something like that happening," said Medha. "My study analyzing heart sound frequencies may be a useful technique that school staff could use to screen for HCM."

The sisters are both athletes—Ilina is a varsity tennis player, and Medha is an accomplished figure skater—and they take a personal interest in the health of athletes. They are also nonsmokers and hope to encourage others not to smoke. After Ilina completed her study and showed her study subjects the results of her tests "two or three of the smokers have quit smoking, and that makes me feel good," says Ilina.

Provided by American College of Chest Physicians