Cardiovascular Risk Profile: Comparison Between White and Southeast Asian Youth in Wausau SCHOOL Project

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ABSTRACT

Introduction: The Wausau School Children Have Early Onset Of Leading Risk Factors of Cardiovascular Disease and Diabetes Mellitus (SCHOOL) Project is a community-based effort to assess the cardiovascular (CV) health of students in the Wausau School District (WSD). It has been previously demonstrated that risk factors for CV disease are prevalent and increase with age. Wausau is also a major relocation center for Southeast Asian (SEA) immigrants. Few data are available on the CV health of SEA immigrants. This investigation compares the relative frequency of CV risk factors in SEA and white students in the WSD.

Methods: A random selection of 2nd, 5th, 8th, and 11th grade students provided demographic data, health history, sex-adjusted body mass index (BMI), fasting glucose levels, blood pressure levels, and nuclear magnetic resonance lipid profiles (Liposcience®). This included 519 white and 48 SEA students. To assess for CV disease risk factors, study participants were examined for dyslipidemia, hypertension, impaired fasting glucose levels, above-normal body weight, and history of smoking.

Results: Risk factors for CV disease increased with age for both white and SEA participants. The mean number of risk factors in SEA participants was 1.63 compared to 1.12 for white participants ($P=0.016$). The mean number of risk factors also increased significantly across grade levels ($P=0.001$). There was no difference in mean BMI values ($P=0.58$). No significant differences were found in triglycerides, total cholesterol, LDL cholesterol, HDL cholesterol, blood pressure, or glucose values. Dyslipidemia was present in 53% of SEA students and 42% of white students ($P=0.14$).

Conclusion: CV risk factors are common in school-age children, and the number of risk factors increases with age. SEA students presented a greater prevalence of CV risk factors than white students, but were not significantly more overweight. Interestingly, in a relatively short time period after immigration, first-generation SEA youth have developed a number of CV risk factors equal to or greater than those of their white counterparts.

INTRODUCTION

The Wausau School Children Have Early Onset Of Leading Risk Factors of Cardiovascular Disease and Diabetes Mellitus (SCHOOL) Project is a community-based effort to assess the cardiovascular (CV) health of students in the Wausau School District (WSD) in Wausau, Wis. SCHOOL Project investigators have previously shown that CV risk factors are prevalent in these students.\footnote{1} The Wausau community is also a major relocation center for Southeast Asian (SEA) immigrants, mostly Hmong relocating from Laos. Twenty-three percent of the WSD and 11% of the total population in Wausau is of SEA decent.\footnote{2,3} Although 20 years ago our CV services team almost never saw cardiovascular disease in SEA immigrants, today it is seen with increasing frequency.\footnote{4}

Little research has been done to explore the cardiovascular health of SEA Americans and even less research has been done on SEA adolescents and children. The purpose of this investigation is to compare the relative frequency of cardiovascular risk factors in SEA and white children in the WSD to help clinicians and educators better identify students who warrant intervention and to design targeted educational opportunities and prevention programs to implement in the classroom.

METHODS

The study was reviewed and approved by the Aspirus Wausau Hospital Institutional Review Committee. Consent was obtained from parent or guardian as
well as assent by student participants. Consent and SCHOOL Project information was translated into Hmong, and informative commercials endorsed by the Wausau Hmong Association were also aired on Hmong Radio stations WXCO 1230 AM and WNRE 93.3 FM. SCHOOL Project enrollment began in November 2002 and was closed June 20, 2003.

Of the total 2642 students recruited from grades 2, 5, 8, and 11, 715 were randomly selected to participate in the SCHOOL Project. Participants came from 13 elementary schools, 2 middle schools, and 2 high schools. Complete blood data, available from 567 students, was used in this sub-study. Of those students, 519 were white and 48 were SEA.

Students submitted demographic data, which included date of birth, sex, race or ethnic identity, family size, and socioeconomic status. Health history data were also collected, including family history of heart disease in first- and second-degree relatives, personal history of heart problems, smoking status of other individuals in the home, and smoking and other tobacco use of the individual. Because of the age of the subjects, some family and health history forms were completed at home.

Twelve-hour fasting lipid and glucose levels were measured using nuclear magnetic resonance technology. This technique provides a standard lipid profile, as well as a measure of the size and number of low-density lipoprotein (LDL) and high-density lipoprotein (HDL) particles. The fasting blood sample was also used to obtain a glucose level.

The 5 cardiovascular risk factors monitored in the Wausau SCHOOL Project included dyslipidemia, impaired fasting glucose levels, positive smoking history, elevated blood pressure, and being above-normal body weight. Dyslipidemia was defined as having any of the following lipid abnormalities: total cholesterol >200mg/dl, LDL cholesterol >130 mg/dl, HDL cholesterol <35 mg/dl, non-HDL cholesterol >160mg/dl, triglycerides >150 mg/dl, or a Pattern B phenotype (average LDL particle size <20.5nm). A fasting glucose level above 100 mg/dl was considered a risk factor. A positive smoking history was defined on the health history questionnaires as “ever smoked.” Blood pressure was taken after 5 minutes of sedentary activity and elevated blood pressure was defined as systolic >120 mmHg and/or diastolic >80 mmHg.

The BMI was corrected for age and sex based on revised growth charts developed by the Centers for Disease Control and Prevention (CDC). The CDC reference values are based on a series of US Health Examination Surveys conducted from 1963 to 1980 for children aged >6 years. Using these data, a standardized body mass index (zBMI) was calculated as a measure of how much each student deviated from the CDC mean. For example, a zBMI of 1 indicates that the student exceeded the mean BMI for a child of that age and sex by 1 standard deviation (SD), while negative numbers indicate values below the mean. Students were considered overweight if they exceeded the 85th percentile in this distribution and obese if they exceeded the 95th percentile.

Using the above definitions, the total number of cardiovascular risk factors per student was assessed along with the mean total number of cardiovascular risk factors for each grade within each ethnic group.

METHODS
Means and SDs were calculated for the continuous variable data and the groups compared by independent group t-tests or analysis of variance tests (ANOVAs). Categorical comparisons were made using Chi-square analyses. All data analyses were conducted using the Statistical Package for the Social Sciences and P<0.05 was considered significant.

RESULTS
Figure 1 illustrates the mean number of risk factors per student as a function of grade and ethnic group. Note that 11th grade students had a significantly higher mean number of risk factors than 2nd grade students for both ethnic groups, with a steady increase in the number of risk factors across grade levels.

There was no significant difference in mean zBMI values between SEA and white students (0.57 versus 0.46, P=0.58). Figure 2 portrays the weight distribution of SEA and white students as a function of BMI percentile. Again, the differences were not significant. SEA students were more likely to admit tobacco use than white students (23% versus 10%, P=0.01). No significant differences between SEA and white students were found in the mean values for total cholesterol (173.6 versus 172.9, P=0.89), LDL cholesterol (116.2 versus 114.0, P=0.58), HDL cholesterol (46.9 versus 47.2, P=0.81), triglycerides (94.3 versus 94.4, P=0.99), fasting glucose values (87.7 versus 86.3, P=0.32), or percent of students with an elevated blood pressure (27% versus 28%, P=0.94). Additionally, neither the mean number of LDL particles (1141.1 versus 1154.3, P=0.77) nor the size of the LDL particles (21.5nm versus 21.4nm, P=0.24) varied significantly between SEA and white students. There was
not a significant difference in the prevalence of dyslipidemia, with 53% of SEA students and 42% of white students having at least 1 lipid abnormality \((P=0.14)\).

Figure 3 summarizes the composite number of risk factors as a function of ethnic group. A Chi-square test indicated a difference in the overall pattern between ethnic groups \((P=0.017)\). In addition, SEA students had a significantly larger mean number of risk factors than white students \((1.63 \text{ versus } 1.12, P=0.002)\). SEA students also were more likely than white students to have 2 or more risk factors \((56\% \text{ versus } 35\%, P=0.005)\).

**DISCUSSION**

The importance of identifying risk factors in the young is becoming increasingly clear. Cardiovascular risk factors found during childhood often extend into adulthood and later progress into cardiovascular disease.\(^7\)\(^,\)\(^15\)\(^-\)\(^17\) Consequently, monitoring and controlling these risk factors during childhood may decrease the overall incidence of CV disease later in life.

This study shows that children and adolescents in the WSD already exhibit significant risk factors for cardiovascular disease, and that these risk factors become more prevalent with age. Furthermore, it is 1 of the first studies to assess the cardiovascular health of SEA immigrants and compare this group to similar white students. Surprisingly, we found that the CV risk of SEA students, as determined by number and frequency of risk factors, actually exceeded that of their white counterparts. SEA students were also more likely to have multiple risk factors and less likely to be free of risk factors. Although no 1 risk factor accounted for this observation, it was largely driven by the tendency for more SEAs to have 1 or more lipid abnormalities.

This study is significant because the prevalence of CV risk factors within this specific ethnic group has not been well characterized, and the early onset of risk factors in SEA youth is even less understood. The relationship between ethnicity and above-normal body weight in children and adolescents has been explored. However, most studies have aggregated all Asians into 1 group or have subdivided Asians into subgroups such as Chinese, Filipino, Japanese, Asian Indian, and other Asian ethnicities without specifying SEA as an individual subset.\(^18\)\(^-\)\(^21\) Nevertheless, these observations suggest that children of immigrants rapidly develop similar cardiovascular risks as their white counterparts, in agreement with the present observation in this specific ethnic group.

To our knowledge, there are no published data available on lipid values in SEA youth. However, there

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**Figure 1.** The mean number of risk factors as a function of grade in white and Southeast Asian (SEA) students. Note the significant increase in the number of risk factors in both ethnic groups as the student ages and the significant difference between the ethnic groups.

**Figure 2.** The weight distribution as a function of ethnic group. No significant difference was observed. Abbreviations: SEA=Southeast Asian, zBMI=standardized body mass index.

**Figure 3.** The number of risk factors as a function of ethnic group. Fewer Southeast Asians (SEAs) were without any cardiovascular (CV) risk factor. SEAs were also more likely to have multiple risk factors.
CONCLUSIONS

CV risk factors are common in school-age children and the number of risk factors increases with age. SEA students presented a greater prevalence of CV risk factors than white students. Interestingly, in a relatively short time period after immigration, first-generation SEA youth have developed a number of CV risk factors that equals or surpasses that of their white counterparts.

Limitations

Although SEA students make up 23% of the WSD population, this group accounted for only 8.5% of the participants in this study due to a lower willingness of this ethnic group to participate in our study. Consequently, it is possible that those who did consent to participate may not have been as representative of the population at large. This criticism exists in nearly all population-based studies in which participation is voluntary.

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REFERENCES


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