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Effects of a multicomponent wellness intervention on dyslipidemia in an overweight adolescent population

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Effects of a multicomponent wellness intervention on dyslipidemia in an overweight adolescent population

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Abstract

Epidemiologic studies suggest that atherosclerotic processes begin in childhood and are associated with abnormal lipid levels, particularly low high-density lipoprotein (HDL) cholesterol, high triglycerides, and small dense low-density lipoprotein particles. These early atherogenic factors are known to increase with consistent exercise and lack of weight gain, whereas smoking and high-fat diets are detrimental. Hemodynamic mechanisms of atherosclerosis have been known to increase with aging, with small vessels more susceptible to the effects of obesity and hypertension. The early effects of atherosclerotic disease can be slowed by lifestyle changes, specifically an increase in exercise and a healthy diet. The primary goal of this study was to assess the effect of a 13-week multicomponent wellness intervention on dyslipidemia in an overweight population.

Background

• Atherosclerotic processes begin in childhood and are associated with abnormal lipid levels, including low HDL cholesterol, high triglycerides, and small dense low-density lipoprotein particles.
• Behavioral and lifestyle changes are recommended as the cornerstone of treatment for dyslipidemia in children and adolescents.
• The primary goal of this pilot study was to assess the effect of a 13-week multicomponent wellness intervention on dyslipidemia in an overweight adolescent population.
• We conducted a sub-study of Fit2Lead, which is a longitudinal behavioral intervention that engages high school students in physical activity, nutrition education, and leadership training.
• In our sub-study we evaluated the lipid profile of participants before and after participation in the intervention.

HYPOTHESIS: High activity level will lead to an improvement in lipids, especially HDL-C which is known to increase with consistent exercise.

Fit2Lead

Conclusions and Future Directions

Exercise and nutrition education coupled with 30-60 minutes of activity per day, 2-4 days per week for 13 weeks resulted in increased HDL-C levels among overweight and obese adolescents.

• Low concentrations of HDL-C show a significant correlation with the size of atherosclerotic lesions present in autopsies obtained from children.
• Majority of participants were low-income, inner-city minority youth which may limit the generalizability of the Fit2Lead intervention in rural populations.

Materials/Methods

Participants

Participants were recruited from Dorchester Academy, a Boston inner-city neighborhood public high school with a high percentage of racially and ethnically diverse students from low income families. Criteria for participation included academic risks due to behavioral issues or poor performance on the Massachusetts Comprehensive Assessment System test (MCAS). The study was approved by the University of Massachusetts Medical School’s Institutional Review Board. Percentile and consent were obtained from participants and parents.

Fit2Lead description

The Fit2Lead pilot study consisted of a 13-week intervention that included a fitness and leadership training program. The program was designed to promote academic achievement, fitness, improved self-concept and work experience. The fitness intervention was delivered at the Gold’s Gym, an innovative youth fitness, research and training center on the University of Massachusetts Boston campus. This comprehensive resource includes access to equipment, weight machines, free weights, and a game area that accommodates active participation in electronic games. During the first 5 weeks, the program consisted of exercise education (15 minutes each) and a 30-60 minute, the program consisted of exercise education (15 minutes each) and a 30-60 minute, the program consisted of exercise education (15 minutes each) and a 30-60 minute, the program consisted of exercise education (15 minutes each). The remaining 8 weeks of the program included exercise education (30 minutes each), exercise 2 times (30 minutes each) per week and nutrition education 2 times (30 minutes each) per week. The exercise component of the program was led by an exercise physiologist and consisted of seven-week sessions, strength training, cardiovascular routines, core training and circuit training. The nutrition education portion of the program was facilitated by the University of Massachusetts Extension’s Supplemental Nutrition Assistance Program Education program (SNAP-Ed) and focused on the food pyramid, healthy meals, cooking, and using kitchen utensils and measuring cups, vegetables, breakfast, and appropriate serving sizes.

Results

**TABLE. Baseline and post-intervention changes in body composition, cardiovascular parameters and questionnaire responses**

<table>
<thead>
<tr>
<th>Measure</th>
<th>Pre-Intervention</th>
<th>Post-Intervention</th>
<th>P-value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Body mass (kg/m2)</td>
<td>30.2 ± 4.4 *</td>
<td>31.4 ± 4.5 **</td>
<td>&lt; 0.05</td>
</tr>
<tr>
<td>BMI %</td>
<td>53.6 ± 4.9</td>
<td>51.6 ± 21.3</td>
<td></td>
</tr>
<tr>
<td>HDL (mg/dL)</td>
<td>47 ± 6.4</td>
<td>54 ± 5.6</td>
<td></td>
</tr>
<tr>
<td>Serum triglycerides (mg/dL)</td>
<td>138 ± 212</td>
<td>136 ± 227</td>
<td></td>
</tr>
<tr>
<td>Triglycerides (mg/dL)</td>
<td>51 ± 27</td>
<td>48 ± 9</td>
<td></td>
</tr>
<tr>
<td>Systolic BP (mm Hg)</td>
<td>115 ± 8</td>
<td>112 ± 8</td>
<td></td>
</tr>
<tr>
<td>Diastolic BP (mm Hg)</td>
<td>74 ± 6</td>
<td>73 ± 6</td>
<td></td>
</tr>
</tbody>
</table>

**P = 0.05 with lean group at baseline**

**P = 0.05 within group, compared with pre-intervention testing**

**P < 0.05 with group, compared with pre-intervention testing**

**Notes:**

1. Data are expressed as mean ± standard deviation
2. BMI: Body mass index
3. HDL-C: High-density lipoprotein cholesterol
4. LDL-C: Low-density lipoprotein cholesterol

**Exercise and nutrition education coupled with 30-60 minutes of activity**

- **Exercise education:** Twice (15 minutes each) and a 30-60 minute, the program consisted of exercise education (15 minutes each) and a 30-60 minute, the program consisted of exercise education (15 minutes each). The remaining 8 weeks of the program included exercise education (30 minutes each), exercise 2 times (30 minutes each) per week and nutrition education 2 times (30 minutes each) per week. The exercise component of the program was led by an exercise physiologist and consisted of seven-week sessions, strength training, cardiovascular routines, core training and circuit training. The nutrition education portion of the program was facilitated by the University of Massachusetts Extension’s Supplemental Nutrition Assistance Program Education program (SNAP-Ed) and focused on the food pyramid, healthy meals, cooking, and using kitchen utensils and measuring cups, vegetables, breakfast, and appropriate serving sizes.

**Data Management**

Differences between the lean and overweight/obese groups in baseline measures were tested for statistical significance after applying a Bonferroni correction for multiple comparisons and Fisher’s exact test for categorical variables. The effect of the intervention on outcome measures was calculated using paired t-test between baseline and 13-weeks. A t-test was used to test differences between the two groups for all outcomes. The effect of the intervention on BMI and intervention group were compared using a t-test for categorical variables. For all outcomes, the results were considered significant if α = 0.05.

Acknowledgments

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