Short-Term Effects of Lifestyle Changes on HDL and Cholesterol / HDL Ratio in The Heart of New Ulm Project

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PROGRAM DESCRIPTION

- Started in 2009, the Heart of New Ulm (HONU) Project is a community-based demonstration project aimed at reducing CVD and associated risk factors in the rural community of New Ulm, MN.
- Interventions are delivered at all levels of the social ecological model (Individual, institutional, community, environmental, policy) via community, worksite, and healthcare settings.

OBJECTIVE

- The LDL-lowering and cardiovascular benefits of statin therapy are well established. However, with the lack of proven benefit from medications that raise HDL, lifestyle behaviors that modify HDL are of significant interest.

- Using data from the HONU Project, we examined the association between 2-year changes in five key lifestyle risk factors, HDL and the total cholesterol/HDL ratio among adult participants.

Table 1: Baseline characteristics; HONU, 2009-2011, n = 1659

	Baseline (2009)
Age y, mean (SD)	53.0 (13.5)
Female	63.7
White	96.7
College degree or higher	37
Cholesterol medication use	19.1
Heart disease or diabetes reported	9.9
Lifestyle factors , %	
Not obese(<30 kg/m^2)	64.9
Current non-smoker	93.9
Physical activity ($\geq$ 150 min / week of moderate-intensity equivalent)	68.8
Fruit and veg ($\geq$ 5srv/day)	18.6
Alcohol consumption (8-14 drinks / week or less)	54.9
Biometric measures, mean(SD)	
High density lipoprotein (HDL, mg/dL)	54.3 (13.9)
Total cholesterol (Chol, mg/dL)	200 (37.0)
Chol/HDL Ratio	3.9 (1.0)

METHODS

- The study is a longitudinal panel analysis of survey and lab data collected as part of the HONU heart health screenings in 2009 and 2011. Our study sample consisted of 1,659 adult residents who attended both screenings.

- The primary exposures of interest were change (from baseline 2009 screening) in individual lifestyle risk factors and a composite optimal lifestyle score (OLS). The OLS score was created by summing two points for each of the following: non-smoker, $\geq$150 min/wk of moderate equivalent physical activity, 0-14 alcoholic drinks/wk, BMI < 30kg/m^2, and $\geq$5 servings per day of fruits and vegetables.

- Each risk and the OLS were categorized as improving, declining or staying the same.

- Frequencies and means(SD) were used to describe the sample. Linear regression models predicting changes in HDL and Cholesterol/HDL over 2 years were run with the change categories for the OLS and its components as the predictors. Age stratified models were also run. A final reduced model is presented.

Table 2: Regression Coefficients of Lifestyle Factors and OLS Composite in Reduced Multivariate Linear Models with Change in Total Cholesterol /HDL Ratio and HDL: HONU, 2009-2011, n = 1659

	Total/HDL ratio change		HDL change (mg/dL)	
Model 1: Lifestyle Components*	coefficient (SE)	p	coefficient (SE)	p
Physical Activity				
Improved[1] (17%)	-0.04 (0.06)	0.490	-0.05 (0.62)	0.941
Declined[2] (8%)	0.11 (0.06)	0.069	0.94 (0.66)	0.153
Smoking				
Improved[1] (2%)	-0.49 (0.15)	0.001	-0.01 (1.59)	0.997
Declined[2] (1%)	0.15 (0.23)	0.520	-1.84 (2.49)	0.459
Obesity				
Improved[1] (5%)	-0.25 (0.08)	0.002	3.21 (0.87)	<0.001
Declined[2] (4%)	0.07 (0.08)	0.386	-2.67 (0.88)	0.002
Model 2: Composite score**				
Improved $\geq$ 1 factor (34%)	-0.90 (0.05)	0.069	0.86 (0.51)	0.089
Declined $\geq$ 1 factor (15%)	0.09 (0.06)	0.088	0.12 (0.59)	0.845

*Adjusted for baseline obese, physical activity, and smoking status , baseline age, education , history of diabetes or heart disease, gender, and cholesterol medication use
**composite of smoking, healthy weight and physical activity: Model Adjusted for baseline composite score , age, education , history of diabetes or heart disease, gender, and cholesterol medication use
HDL: high density lipoprotein, Chol : cholesterol , BMI: body mass index
1: Improved: BMI: obese in 2009 and not obese in 2011; smoking: smoking in 2009 and not smoking in 2011; Physical activity: < 150min per week in 2009 and >=150min/week in 2011
2: Declined: BMI: not obese in 2009 and obese in 2011; smoking: not smoking in 2009 and smoking in 2011; Physical activity: >=150min per week in 2009 and <150min/week in 2011
Reference category is unchanged lifestyle components and composite score for respective models

RESULTS

- Mean (se) change in HDL and cholesterol from 2009 was -1.8 (0.2) and -5.6 (0.7) respectively.

- On average, those who were obese in 2009 and not obese in 2011 lowered their Chol/HDL ratio by 0.25 and increased their HDL by 3.21mg/dL more than those with stable BMI.

- Participants who quit smoking decreased their Chol/HDL ratio on average 0.49 more than those whose smoking status remained unchanged.

- Participants younger than 50 years who increased their physical activity experienced an average(se) decrease in their Chol/HDL ratio of 0.20(0.1) compared to those with no change in physical activity (p-value =0.045).

- Participants 50 years or older who decreased physical activity experienced an increase in average (se) Chol/HDL ratio of 0.19(0.1) more than those with no change in physical activity (p-value =0.023).

- A combination of improvements in any of the three factors (smoking, BMI or physical activity) showed a moderate impact on raising HDL compared to those who remained stable.

CONCLUSIONS

- After adjustment for demographic and clinical factors, weight loss was the strongest lifestyle predictor of increased HDL in this rural sample of adults.

- Quitting smoking was associated with significantly improved Total/HDL cholesterol ratio and decreased physical activity was associated with (borderline) significantly poorer Total/HDL cholesterol ratio.

- In conjunction with high quality CVD preventive medical care, continued implementation of programs that promote and maintain healthy lifestyle habits may result in more favorable population-level lipid profiles.

The authors have no conflicts of interest to report.