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Research Article,

The possible attribution of abnormal lipid concentrations in Heart Failure: A comparative study.

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Abstract:

Objective: To find out the role of dyslipedemia as a contributing factor in heart failure cases and study comparatively with the Framingham study (Meta analysis).

Methods: This was a cross- sectional study conducted in a tertiary care hospital. The study was approved by the ethics committee of the institute and consent was taken from each participant before enrolling in the study. A total of 100 cases with signs and symptoms of heart failure (Acute/Acute on Chronic and Chronic heart failure) were included in the study.

Background: The relationship of lipid concentrations to heart failure has been evaluated in a study derived from Framigham Heart study participants.

Introduction:

Heart Failure (HF) is a syndrome associated with high morbidity and mortality and enormous economic burden, rendering prevention a priority.[1] Elucidating modifiable risk factors for HF will aid the identification and promulgation of prevention strategies. Dyslipidemia is a well-established risk factor for coronary heart disease (CHD)[2] and results from clinical trials of lipid-modifying therapy demonstrate that treatment with statins also decreases the incidence of HF.[3] This finding suggests that dyslipidemia is a risk factor for HF, although the association may be mediated by the occurrence of myocardial infarction (MI). The Framingham Heart Study detected a direct association between the ratio of total cholesterol to HDL-C and HF risk,[5] suggesting that either elevated total cholesterol, or a lowered HDL-C may influence HF risk. Although previous studies assessed the associations between individual lipid measures and HF,[4,5] the role of lipids in the incidence of HF in people without pre-existing CHD has not been systematically investigated in a community-based setting in a prospective fashion, with appropriate adjustment for clinical factors (including interim occurrence of MI) that influence HF risk. Elevated low density lipoprotein cholesterol (LDL-C) and decreased high density lipoprotein cholesterol (HDL-C) have been shown to be associated with reduced systolic and diastolic LV function.[6,7]. Also a previous investigation from the Framingham Heart Study detected a direct association between the ratio of total cholesterol to HDL-C and HF risk,[5] suggesting that either elevated total cholesterol, or a lowered HDL-C may influence HF risk. ‘

In our study 100 participants (49% women) patients with unadjusted HF incidence in the low (<160mg/dl) vs. high (≥190mg/dl) non-HDL-C groups was 7.9% and 13.8%, respectively, whereas incidence in the high (≥55 [men], ≥65 [women] mg/dl) vs. low (< 40 [men], <50 [women] mg/dl) HDL-C groups was 6.1% and 12.8%, respectively. In multivariable models, baseline non-HDL-C and HDL-C, carried HF hazards (confidence interval-CI) of 1.19 (1.11–1.27) and 0.82 (0.75–0.90) respectively per standard deviation (SD) increment .Participants with high baseline non-HDL-C and those with low HDL-C experienced a 29% and 40% higher HF risk respectively, compared to those in the desirable categories; the PARs for high non-HDL-C and low HDL-C were 7.5% and 15% respectively.

Table 1 Relationship of lipid concentration to heart failure cases

	MULTIVARIABLE ADJUSTED		
	HR	95% C I	p-value
	SINGLE BASE LINE MEASUREMENTS		
HDL – C	0.82	0.75-0.90	< 0.001
Non HDL- C	1.19	1.11-1.27	<0.001

Statistical analysis:

Population burden of HF secondary to dyslipidemia by calculating category-specific population attributable risk (PAR), as a function of the proportion of cases (Pd) of HF occurring in each category of HDL-C and non-HDL-C and the relative risk (RR – the hazards ratio from the model adjusting for clinical covariates). The formula we used (expressing PAR as a percentage) is : PAR = Pd ([RR-1]/RR) × 100

Hazards ratios are expressed per standard deviation increment in a lipid value (for analyses using lipids as continuous variables), or comparing the non-optimal lipid concentrations to the referent category. A p-value threshold of 0.05 was used to determine statistical significance. All statistical analyses were performed using SAS software version 8.0 (SAS institute, Cary, NC).

Analysis of single base line measurements are based on values obtained at the time of Hospitalization.

HR = hazard ratio per standard deviation of the in lipid value. 95% CI = 95% of Confidence intervals.

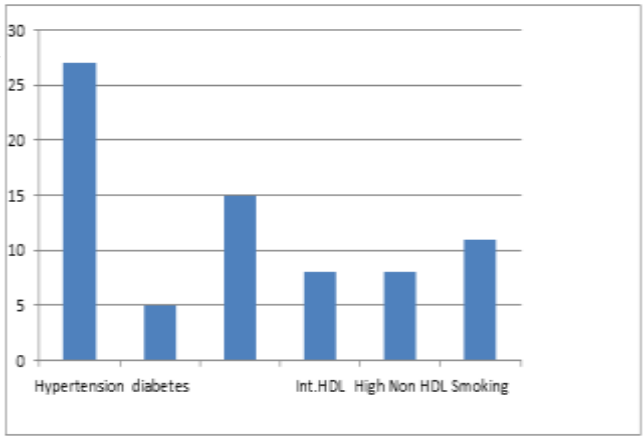

Figure 1

Population attributable risks for major heart failure risk factors:- were calculated from a model that is adjusted for age,sex, body weight,BMI, hypertension (yes/no), smoking (yes/no),and HDL-C (men<40mg/dl,40-54mg/dl,55mg/dl or greater; women<50mg/dl,50-64mg/dl,65mg/dl or greater) and non HDL –C (<160mg/dl, 160-189 mg/dl,190mg/dl or greater) categories

Discussion:

Lipids and HF: Comparison with the Published Literature:-

Previous observational studies have addressed associations of lipid measures with incidence of HF. Kannel et al reported that an elevated total/HDL ratio is associated with increased HF risk.[5] Another report from the Framingham Heart Study noted an association, albeit of modest magnitude, between total cholesterol and HF risk.[22] Elevated triglycerides have been implicated in HF incidence in the elderly.[4] One case-control study reported independent associations between decreased HDL-C and elevated triglycerides and dilated cardiomyopathy.[23] Ingelsson et al identified decreased HDL-C and an elevated apolipoprotein B/A-1 ratio (the ratio of the main lipoproteins in LDL-C and HDL-C respectively) as independent predictors of HF risk in a prospective community-based study.[24] Investigators from the Physician Health Study identified egg consumption (a rich source of cholesterol) as a risk factor for HF.[25] Similarly, increased intake of saturated fat was also implicated as a HF risk factor in a report from the Atherosclerosis Risk in Communities study.[26] Another prospective study from Uppsala identified metabolic syndrome (typically associated with elevated triglycerides and low HDL-C) as a HF risk factor.[27] Prior investigations, however, were limited by lack of systematic exclusion of baseline CHD and did not consistently adjust for a panel of clinical covariates including interim MI. Furthermore, previous studies did not assess the full range of lipid level alterations.

Conclusion:

Based on a comprehensive evaluation of lipid concentrations derived from prospective observation of a healthy, free-living sample, we demonstrate that elevated levels of non-HDL-C and decreased levels of HDL-C are associated with increased risk of HF. It is noteworthy that 15% of heart failure cases were attributable to low HDL-C concentrations. The HF risk associated with dyslipidemia appears to be partly independent of the influence of lipids on risk of MI. These findings lend mechanistic support to previous observations of benefit from lipid therapy in reducing HF incidence. Given the high prevalence of dyslipidemia in the community[19], our report

highlights the possibility of reducing HF burden by targeting abnormal lipid concentrations for treatment.

Table 2 Base line characteristics of the participants SD=Standard deviation

Clinical co-variates, mean SD or %	Total participants (N=100)
Age in yrs	44(15)
Women	54
BMI(Kg/m^2)	25.3(4.2)
BP (S)	127(20)
Smoking	41
Hypertension	29
Hypertension (Tt)	6.3
Lipid Measure, mean (SD)	
Total Cholesterol (mg/dl)	209(43)
HDL (C) mg/dl	52(16)
Non HDL (C) mg/dl	156(45)

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