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Research Article

Glycated Hemoglobin in the Pre and Diabetes Ranges as Related to Lipid Cardiovascular Risk

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Abstract

The concomitance of diabetes metabolic markers, as Glycated Hemoglobin and blood glucose, together with lipid changes; Cholesterol and fractions and Triglycerides, occurs very frequently but not always in the same pairs of markers, being its peculiarities important factors for the estimation of the cardiovascular risk. Not only has the association of high glucose levels and high triglycerides pointed to an augmented risk. The study of the correlations of the parameter Glycated Hemoglobin with all the values of the lipid profile may help gain a broader insight as to the associated risks. A database of 548 individuals with concomitant results of HbA1C, triglycerides, CT and HDL-c were applied statistical tests of ANOVA and Tukey. Most of the 546 individuals tested for glycated hemoglobin (HbA1C) and lipid profile had HbA1C levels within normal range (49.8%), 15.4% were classified as prediabetic, and 34.8% had HbA1C levels above 6.4% (diabetics). The overall mean HbA1C observed was 6.3%, and triglycerides was 236.8 mg/dL. Data from HbA1C-lipid profile comparisons are not superimposed, as expected, to the combinations of fasting glucose and triglycerides. In not accompanying lipids concomitantly with HbA1C, the correct assessment of the overall risk calculation for atherosclerosis can be omitted. In conclusion, HbA1C levels should be added to the lipid profile for a more accurate estimation of the cardiovascular risk.

Keywords: glycated hemoglobin, blood glucose; cholesterol; triglycerides; hdl cholesterol

Introduction

There is a very frequent simultaneity of changes in blood glucose and triglycerides, however the same does not occur for Glycated Hemoglobin (HbA1C). The atherosclerotic disease prevention recommendations is that all multifactorial risk markers must be taken into consideration [1-6].

Objective

To evaluate the comparison of HbA1C data with those of total cholesterol (TC), triglycerides and HDL cholesterol (HDL-c) collected simultaneously in a cohort large enough to point out the existence or not of significance.

Method

A database of 548 individuals with concomitant results of HbA1C, triglycerides, CT and HDL-c were applied statistical tests of ANOVA and Tukey.

HbA1C: The HbA1C total blood measurement method, in the Hilab remote laboratory test (RLT), is a quantitative immunoassay based on the principle of sandwich binding with two antibodies. Cholesterol: colorimetric enzymatic method (RLT). HDL-c: by precipitation.

Triglycerides: Triglycerides are evaluated in reactive strip by colorimetric enzymatic reaction. The Hilab RLT uses reflectance photometry and the results can be evaluated between 120 and 400 mg/dL.

Results

Most of the 546 individuals tested for glycated hemoglobin (HbA1C) and lipid profile had HbA1C levels within normal range (49.8%), 15.4% were classified as prediabetic, and 34.8% had HbA1C levels above 6.4% (diabetics). The overall mean HbA1C observed was 6.3%, and triglycerides was 236.8 mg/dL (Table 1).

Analyt	Minimum	Average	Maximum	1Q	3Q
Glycated Hemoglobin (%)	2.7	6.3	14.5	4.87	7.08
Triglycerides (mg/dL)	120.1	236.8	399.8	168.87	299.43
Total Cholesterol (mg/dL)	120.2	202.1	374.7	159.93	236.82
HDL-c (mg/dL)	20.6	49.6	99.1	38.71	57.81

Table 1: *Descriptive summary of glycated hemoglobin and lipid profile analydes.*

We found a significant difference in the mean triglycerides between those with levels below 5.7% and the other two categories ($F_2=17.04$, $p <0.0001$; Tukey's post-hoc: <5.7% vs 5.7-6.4% $p = <0.0222$; <5,7% vs >6.4% $p<0.0001$). The mean total cholesterol also varied significantly between the clinical ranges of HbA1C ($F_2=7.04$, $p=0.0010$) (Table 2).
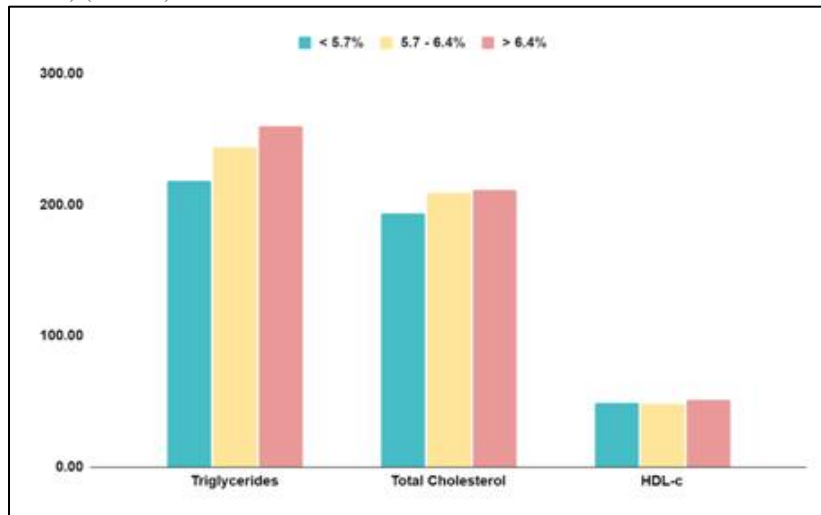

Figure 1: *Graphical representation of lipid profile according to HbA1C ranges.*

	Glycated Hemoglobin (HbA1C)						
	< 5,7%		5,7 - 6,4%		> 6,4%		
	n = 272 (49,8%)		n = 84 (15,4%)		n = 190 (34,8%)		ANOVA
	Average	SD	Average	SD	Average	SD	p
Triglycerides	218.22	76.11	243.84	74.82	260.36	79.96	< 0.0001
Total Cholesterol	193.32	51.59	209.33	57.95	211.46	57.29	0.0010
HDL-c	48.82	14.33	48.08	15.48	51.29	16.19	0.1430

Table 2: *Means and standard deviation (SD) of lipid profile analytes by clinical range of Glycated hemoglobin and p-value of the ANOVA test comparing analyte means between clinical ranges.*

Discussion

Data from HbA1C-lipid profile comparations are not superimposed, as expected, to the combinations of fasting glucose and triglycerides. In not accompanying lipids concomitantly with HbA1C, the correct assessment of the overall risk calculation for atherosclerosis can be omitted.

Conclusion

Whenever possible, HbA1C assay should be should be interpreted together with the lipid profile for a more comprehensive assessment of the overall risk of the patient for atherosclerosis.

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Conflicts of interest

None.

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