The Hemoglobin Glycation Index Influences Glycemic Classification: the Vitamin D and Type 2 Diabetes (D2d) Study

Daniel S Hsia[1], Cyrus V Desouza[2], Lawrence S Phillips[3], Jason Nelson[4], Anastassios G Pittas[4], Neda Rasouli[5], and the D2d Research Group

[1]Pennington Biomedical Research Center, [2]University of Nebraska Medical Center, [3]Atlanta VA Medical Center, [4]Tufts Medical Center, [5]University of Colorado, Denver

INTRODUCTION

- Hemoglobin Glycation Index (HGI) quantifies interindividual variation in HbA1c due to factors other than glycemia[1]
- HGI captures the difference between observed and predicted HbA1c. Predicted HbA1c is derived from a linear regression equation of HbA1c versus fasting plasma glucose (FPG)[2]
- HGI has been used to risk-stratify patients with type 1 and type 2 diabetes for micro- and macro-vascular complications[3,4]
- HGI's impact on glycemic classification in a population at risk for diabetes has not been studied
- The Vitamin D and type 2 diabetes (D2d) study is a randomized trial to investigate the effect of vitamin D supplementation on prevention of diabetes in people with prediabetes[5]
- We hypothesized that HGI would influence glycemic classification, as determined by HbA1c and/or 2-hour plasma glucose (2hPG) in a 75-g oral glucose tolerance test (OGTT)

METHODS

- Screening for D2d occurred over 2 visits
- FPG levels from 6516 participants with FPG<126 mg/dL at Screening Visit 1 were used to estimate the regression equation (Figure 1)
- In a subset of 3960 participants who completed Screening Visit 2, HGI was determined as the difference between observed and predicted HbA1c
- Participants were divided into low, moderate, and high HGI tertiles
- Baseline characteristics are summarized in Table 1
- In diabetes range was defined as 2hPG ≥ 200 mg/dL
- Impaired 2hPG was defined as 2hPG from 140-199 mg/dL
- Impaired A1c was defined as HbA1c from 5.7-6.4%

RESULTS

Figure 1 Regression equation used to derive predicted HbA1c

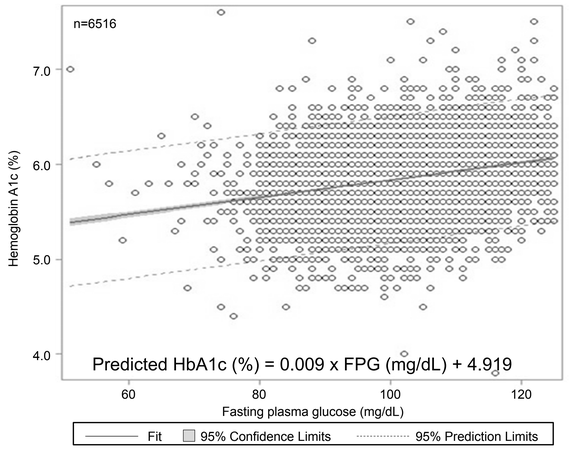


Figure 2 HGI was calculated as the difference between observed HbA1c and predicted HbA1c then divided into tertiles

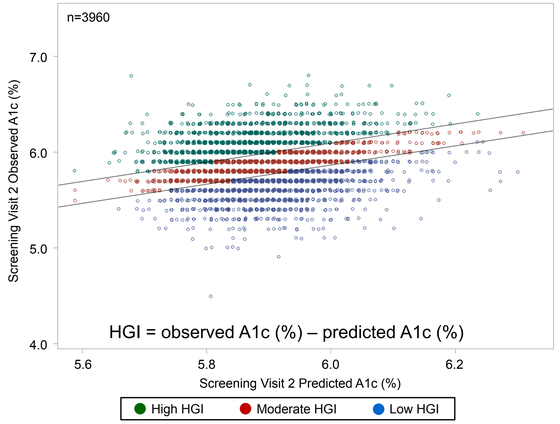
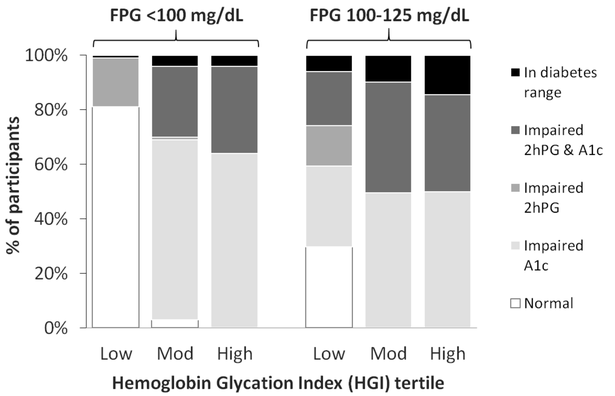


Table 1 Baseline Characteristics

	Low HGI	Moderate HGI	High HGI	p-value
Age, mean ± SD	58.5±10.5	59.4±10.3	58.9±9.8	0.09
BMI, mean ± SD	31.7±4.5	31.8±4.7	32.1±4.8	0.06
Sex, n (%)				<0.01
Female	533 (30)	603 (33)	674 (37)	
Male	768 (36)	719 (33)	663 (31)	
Race, n (%)				<0.01
African American	179 (18)	284 (28)	550 (54)	
Non-African American	1122 (38)	1038 (35)	787 (27)	
Ethnicity, n (%)				0.18
Hispanic or Latino	110 (29)	138 (36)	136 (35)	
Not Hispanic or Latino	1191 (33)	1184 (33)	1201 (34)	

Figure 3 Glycemic characterization based on HGI



DISCUSSION

- Higher proportion of females and African Americans were in the high HGI tertile
- For those with FPG < 100 mg/dL (n=968), the prevalence of HbA1c and/or 2hPG in prediabetes and diabetes range was 18% and 1% respectively in the low HGI tertile versus 96% and 4% in the high HGI tertile (all p<0.01)
- For those with FPG 100-125 mg/dL (n=2821), the prevalence of HbA1c and/or 2hPG in prediabetes and diabetes range was 64% and 6% respectively in the low HGI tertile versus 84% and 16% in the high HGI tertile (all p<0.01)

CONCLUSIONS

- Inter-individual variation in hemoglobin glycation relative to glucose levels is affected by sex and ethnicity in this population at risk for diabetes
- In people with similar FPG values, those with higher HGI are more likely to have HbA1c or 2hPG values in the prediabetes or diabetes range
- HGI might play a role in better classifying patients at risk for prediabetes or diabetes
- Future studies may incorporate HGI as part of diabetes risk assessment in those with prediabetes

References

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