GLYCATED ALBUMIN IS SUPERIOR TO GLYCATED SERUM PROTEIN AND CORRECTED FOR SERUM ALBUMIN AND HEMOGLOBIN HbA1c IN DETECTING GLYCEMIC CONTROL STATUS AMONG DIABETIC PATIENTS ON HEMODIALYSIS: A CONTINUOUS GLUCOSE MONITORING STUDY

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Introduction: Glycated hemoglobin A1c (HbA1c) is a poor indicator of glycemic control status among diabetic hemodialysis patients [1,2]. Among these patients, the diagnostic accuracy of other novel glycated analogs in detecting glycemic control status remains unclear, since previous validation studies were relied on a few sporadic and not necessarily fasting blood glucose measurements [3,4]. The aim of this study is to evaluate the validity of glycated albumin (GA), glycated serum protein (GSP) and corrected for albumin and hemoglobin HbA1c (corrHbA1c) in detecting glycemic control among diabetic hemodialysis patients using 7-day continuous glucose monitoring (CGM) as the reference standard.

Materials and Methods: A 7-day-long CGM system (Medtronic Diabetes, Northridge, CA, USA) was applied in 37 diabetic hemodialysis patients enrolled in this study. We compared the accuracy of corrHbA1c, GSP, and in detecting 7-day average glucose ≥184 mg/dl by performing ROC analysis. Patients with 7-day average glucose ≥184 mg/dl were classified as having uncontrolled diabetes on the basis of studies conducted in diabetic patients with preserved renal function showing that this cutoff value reflects a poor glycemic control status indicated by a corresponding HbA1c of ≥8% [5].

Results: The baseline demographic and clinical characteristics of study participants are presented in (**Table 1**). Patients with 7-day average glucose ≥184 mg/dl had significantly higher levels of corrHbA1c, GSP and GA relative to those with 7-day average glucose <184 mg/dl (8.6±1.1 vs 7.2±1.4% for corrHbA1c, 698.7±126.9 vs 584.7±192.9μmol/l for GSP and 23.0±2.2 vs 14.6±3.9% for GA, p<0.01 for all comparisons) (**Table 2**)**.** In correlation analysis, GA exhibited stronger association with 7-day average glucose (r=0.884, p<0.001) than corrHbA1c (r=0.721, p<0.001) and GSP (r=0.672, p<0.001) (**Figure 1**)**.** The area under receiver-operating characteristic curve (AUC) for HbA1c, corHbA1c, GSP and GA to detect poor glycemic control was 0.776 (0.629-0.923), 0.790 (0.643-0.938), 0.682 (0.502-0.862) and 0.976 (0.001-1.000), respectively (**Figure 2**)**.** The sensitivity of HbA1c ≥8%, corHbA1c ≥8%, GSP ≥588μmol/l and GA ≥20.3% to detect 7-day average glucose ≥184 mg/dl was 36.4%, 72.7%, 81,8% and 90.9% respectively. The specificity of HbA1c ≥8%, corHbA1c ≥8%, GSP ≥588.0 μmol/L and GA ≥20.3% was 85.6%, 85.6%, 61.5% and 96.2%, respectively.

Conclusion: This study shows that among diabetic hemodialysis patients, GA is superior to corrHbA1c and GSP in detecting poor glycemic control assessed with the use of 7-day-long CGM.

Table 1: Baseline characteristics of study participants

Parameter	Value
N	37
Age (years)	62.0±12.7
Gender (M/F)	20/17
Dialysis vintage (months)	37.1±6.9
Weight (kg)	75.9±13.8
Height (m)	1.6±0.1
BMI (kg/m^2)	26.9±4.2
Hypertension (%)	32, (86.5%)
History of CHD (%)	23, (62,2%)
History of CHF (%)	17, (45.9%)

Table 2: Comparison of different glycemic control indices between patients with high versus low average 7-day CGM-derived glucose

Parameter	Overall	7-day glu ≥184 mg/dl	7-day glu <184 mg/dl	P value
N	37	11	26	
Average glucose (mg/dl)	162.1±38.1	207.3±18.9	143.0±25.9	<0.001
HbA1c (%)	6.5±1.4	7.4±1.0	6.1±1.4	0.009
corrHbA1c (%)	7.6±1.5	7.2±1.5	8.6±1.1	0.081
Glycated Protein (mg/dl)	618.6±181.9	584.7±192.9	698.7±126.9	0.004
Glycated Albumin (%)	17.1±5.2	14.6±3.9	23.0±2.2	<0.001

Figure 1: Correlation analysis between mean 7-day CGM-derived glucose and glycated albumin levels.

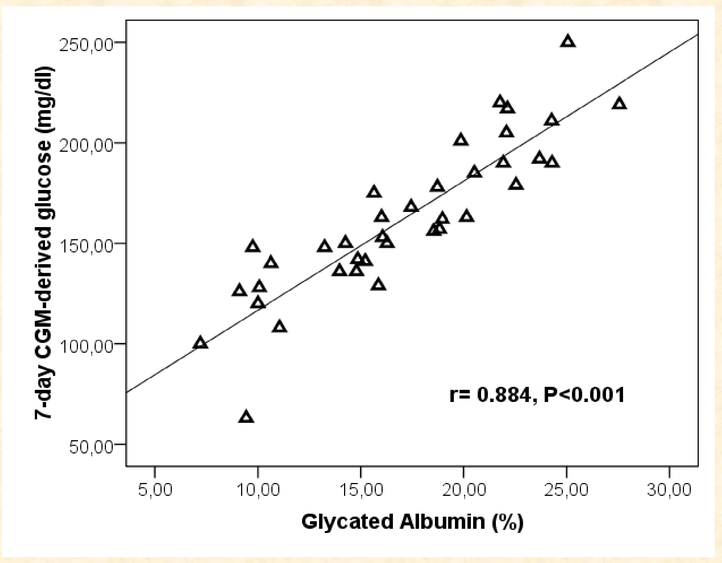
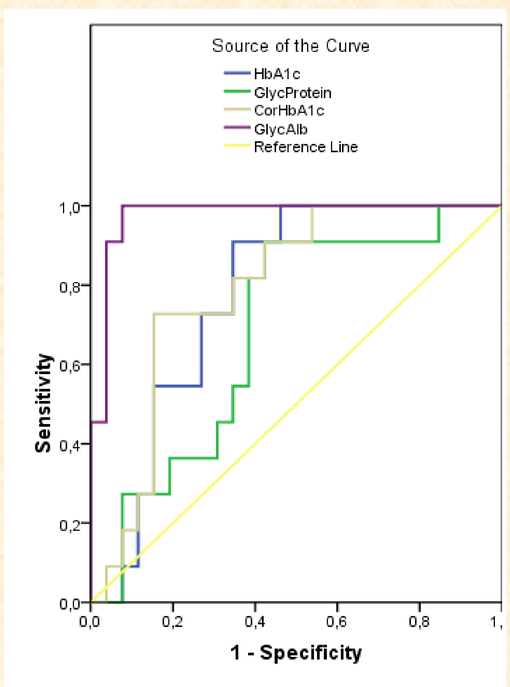


Figure 2: AUC of HbA1c, corrected HbA1c, glycated serum protein and glycated albumin to detect poor glycemic control on the basis of a 7-day average glucose ≥184 mg/dl



Parameter	AUC	95% CI	P value
HbA1c	0.776	(0.629-0.923)	0.009
corrHbA1c	0.790	(0.643-0.938)	0.006
GlycProtein	0.682	(0.502-0.862)	0.084
GlycAlbumin	0.976	(0.001-1.000)	<0.001

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