



# Association of HbA1c Level and Long-Term Variability with Electrodiagnostic Severity of Diabetic Polyneuropathy (Baba's Classification) in Type 2 Diabetes : A Single-Center Retrospective Observational Study

**Songi Han, M.D., JongKyu Kim, M.D.**

Seoul Medical Center, Department of Physical Medicine & Rehabilitation

## Objective

To assess whether index HbA1c, mean HbA1c, and HbA1c variability (SD, CV) are associated with electrodiagnostic DPN severity by Baba's classification and to explore cut-offs for Baba stage  $\geq 2$ .

## Methods

Retrospective study of 263 T2DM patients who underwent NCS (2022–2024). After excluding 140 patients with non-DPN neurologic disorders, 73 patients with  $\geq 4$  HbA1c measurements over  $\geq 2$  calendar years were included. Outcomes were Baba stage (0–4) and Baba stage  $\geq 2$ . Adjusted ordered logistic, logistic, and ROC analyses were performed.

## Results

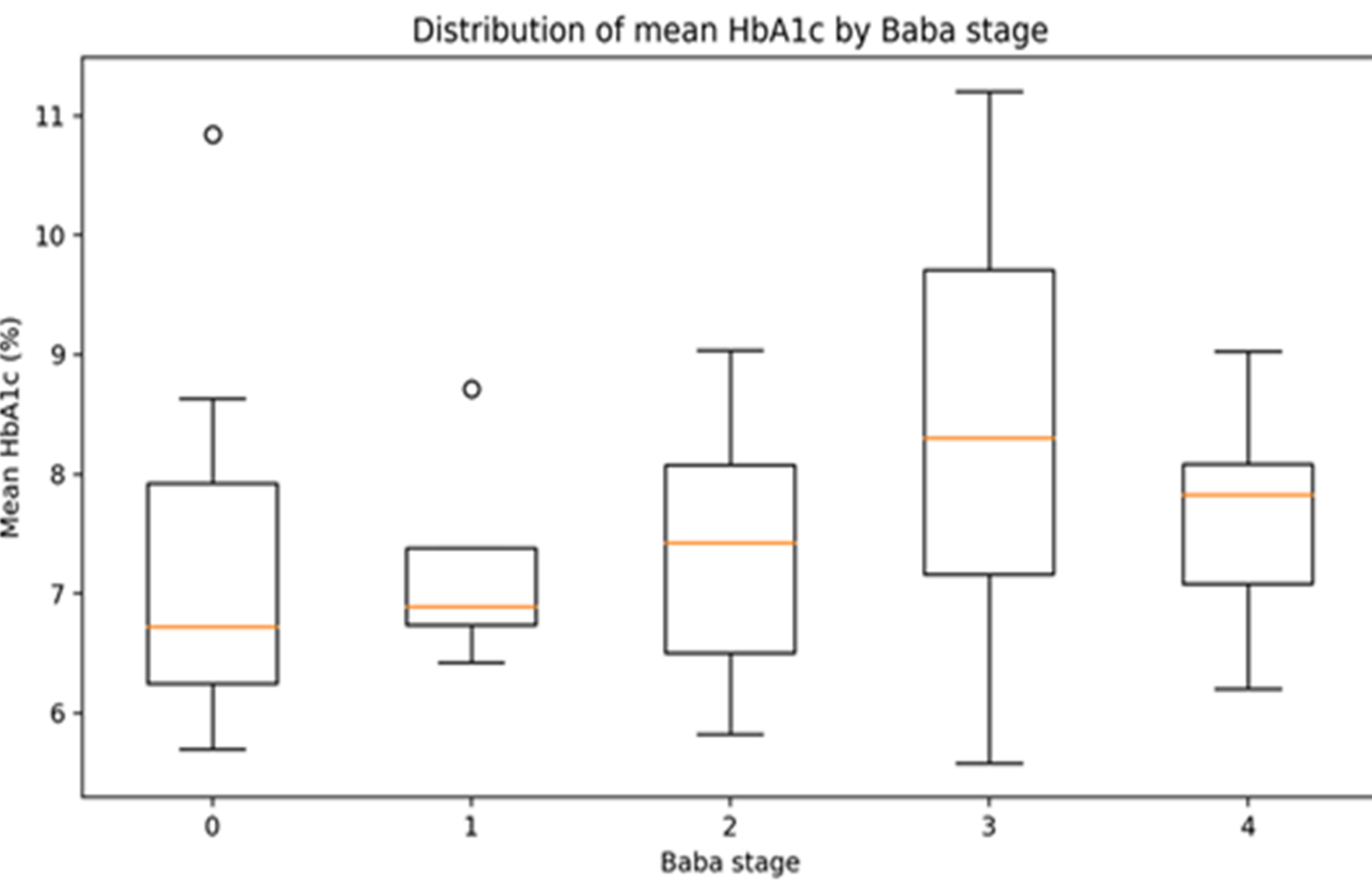
In the fully adjusted model, mean HbA1c was significantly associated with worse Baba stage (M3: OR 1.51,  $p=0.034$ ), whereas index HbA1c showed a weaker association. After adjustment for mean HbA1c, HbA1c CV showed an additional trend toward predicting Baba stage  $\geq 2$  (M3: OR 1.09,  $p=0.064$ ). ROC-derived cut-offs for Baba stage  $\geq 2$  were 7.07% for mean HbA1c, 8.00% for HbA1c CV, and 0.62 for HbA1c SD.

## Conclusion

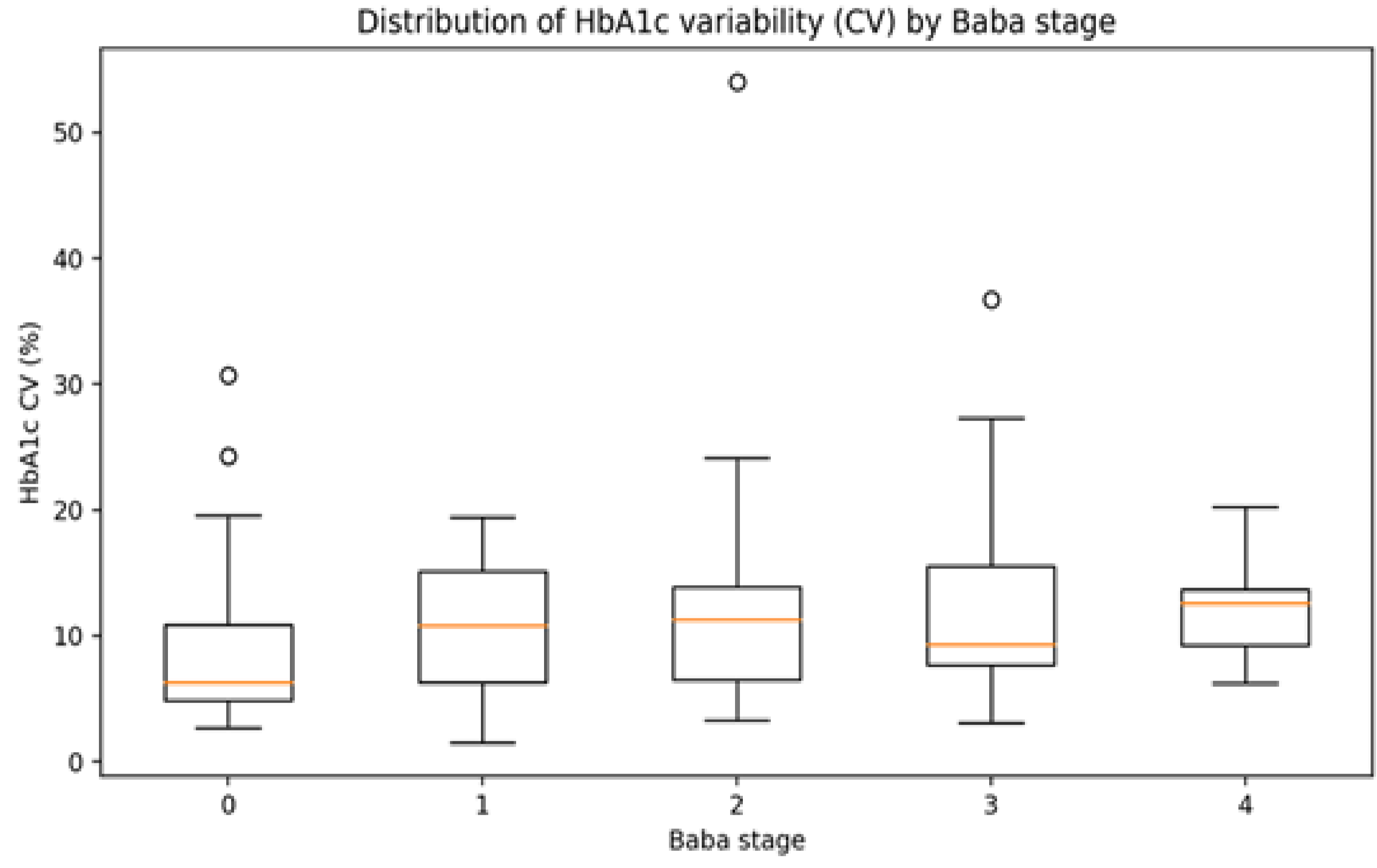
Long-term mean HbA1c was more informative than index HbA1c for electrodiagnostic DPN severity, and glycemic variability provided complementary information. Candidate thresholds for Baba stage  $\geq 2$  were 7.07% for mean HbA1c and 8.00% for HbA1c CV.

**Figure1.** Distributions of HbA1c level and variability by Baba stage.

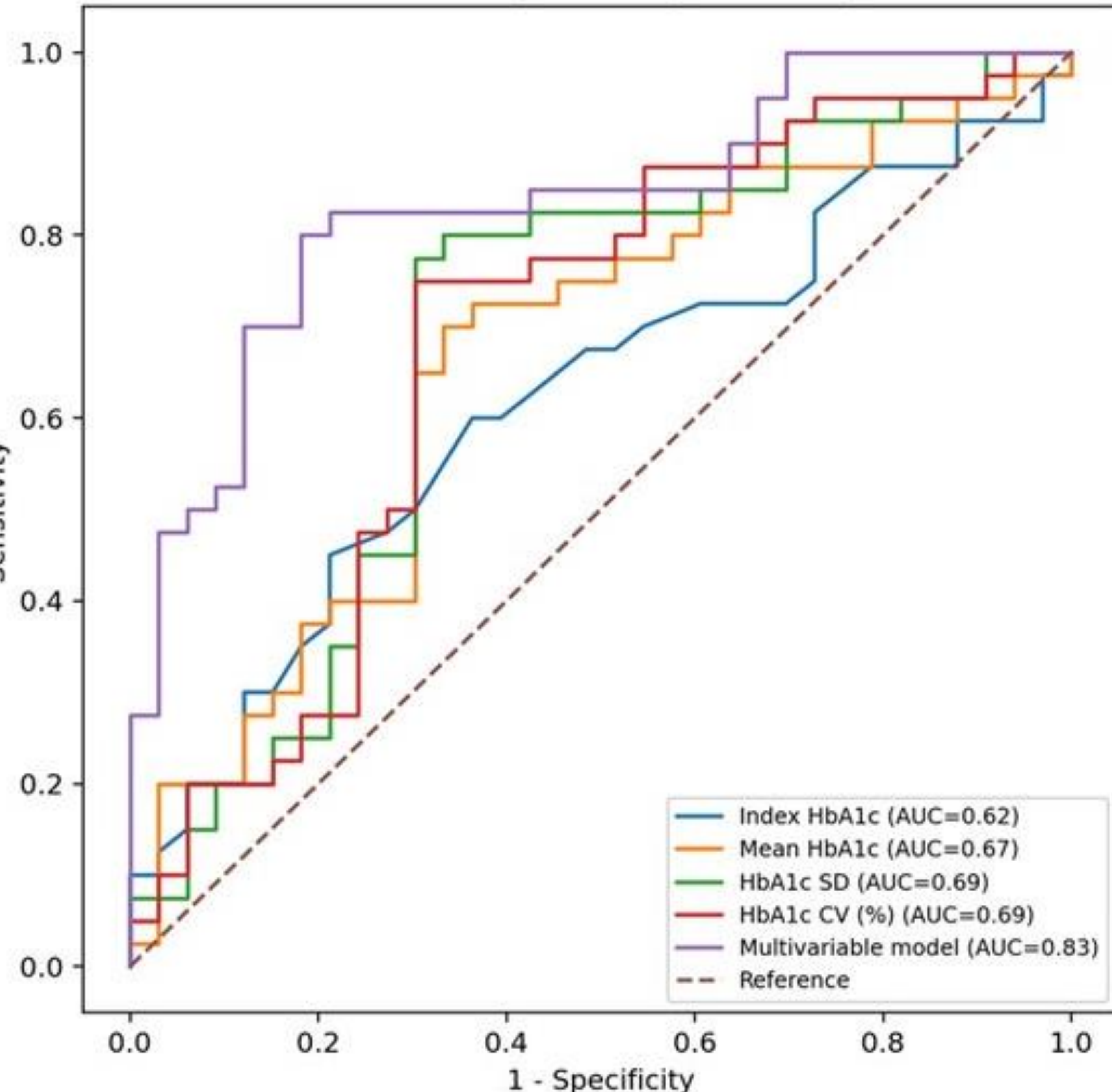
**Figure1A.** mean HbA1c



**Figure1B.** HbA1c CV (%)



**Figure2.** ROC curves for predicting Baba stage  $\geq 2$ .



**Table1.** Baseline characteristics (Baba 0–1 vs Baba  $\geq 2$ ).

Variables	Baba 0–1 (n=33)	Baba $\geq 2$ (n=40)	p-value
Age(years)	64.94 $\pm$ 6.96	67.62 $\pm$ 11.80	0.232
Male sex, n(%)	19 (57.6%)	34 (85.0%)	0.016
DM duration(years)	10.00 [8.00-10.00]	10.00 [7.00-19.25]	0.196
eGFR_index (mL/min/1.73m <sup>2</sup> )	86.64 $\pm$ 18.97	67.72 $\pm$ 28.85	0.001
Index HbA1c (%)	6.92 $\pm$ 1.13	7.60 $\pm$ 1.70	0.045
Mean HbA1c (%)	7.09 $\pm$ 1.11	7.78 $\pm$ 1.29	0.016
HbA1c SD	0.45 [0.32–0.89]	0.80 [0.63–1.15]	0.006
HbA1c CV (%)	7 [5–11]	11 [8–14]	0.007
Insulin user, n(%)	8 (24.2%)	16 (40.0%)	0.212
ESRD on HD, n(%)	0 (0.0%)	3 (7.5%)	0.247
DM retinopathy, n(%)	5 (15.2%)	16 (40.0%)	0.022
DM foot disease, n(%)	2 (6.1%)	11 (27.5%)	0.029
PAD, n(%)	5 (15.2%)	6 (15.0%)	1.000
ASCVD(any), n(%)	3 (9.1%)	10 (25.0%)	0.123



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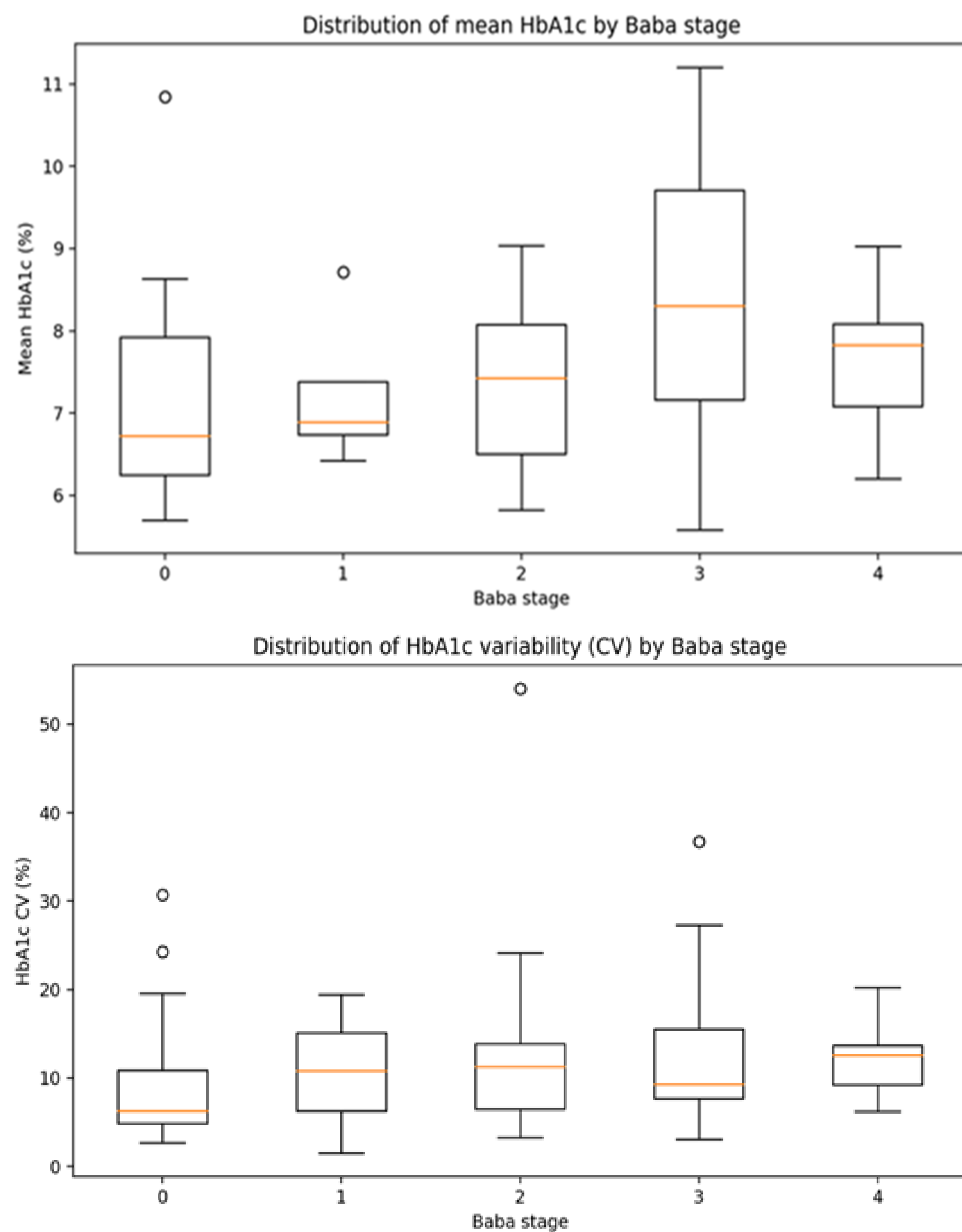
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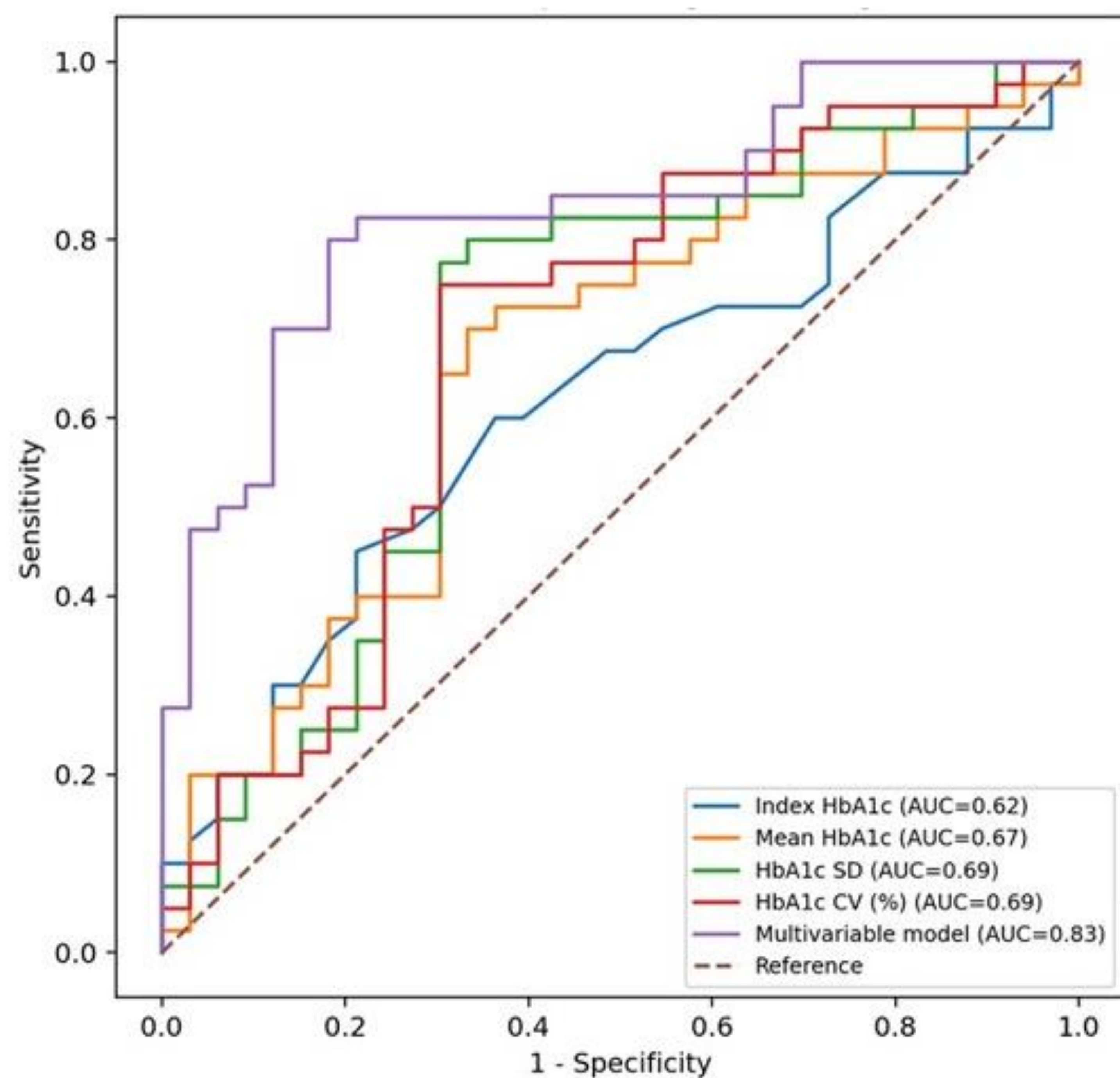
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**Figure1.** Distributions of HbA1c level and variability  
**Figure1A.** mean HbA1c by Baba stage.  
**Figure1B.** HbA1c CV (%) by Baba stage.



**Figure2.** ROC curves for predicting Baba stage  $\geq 2$ .





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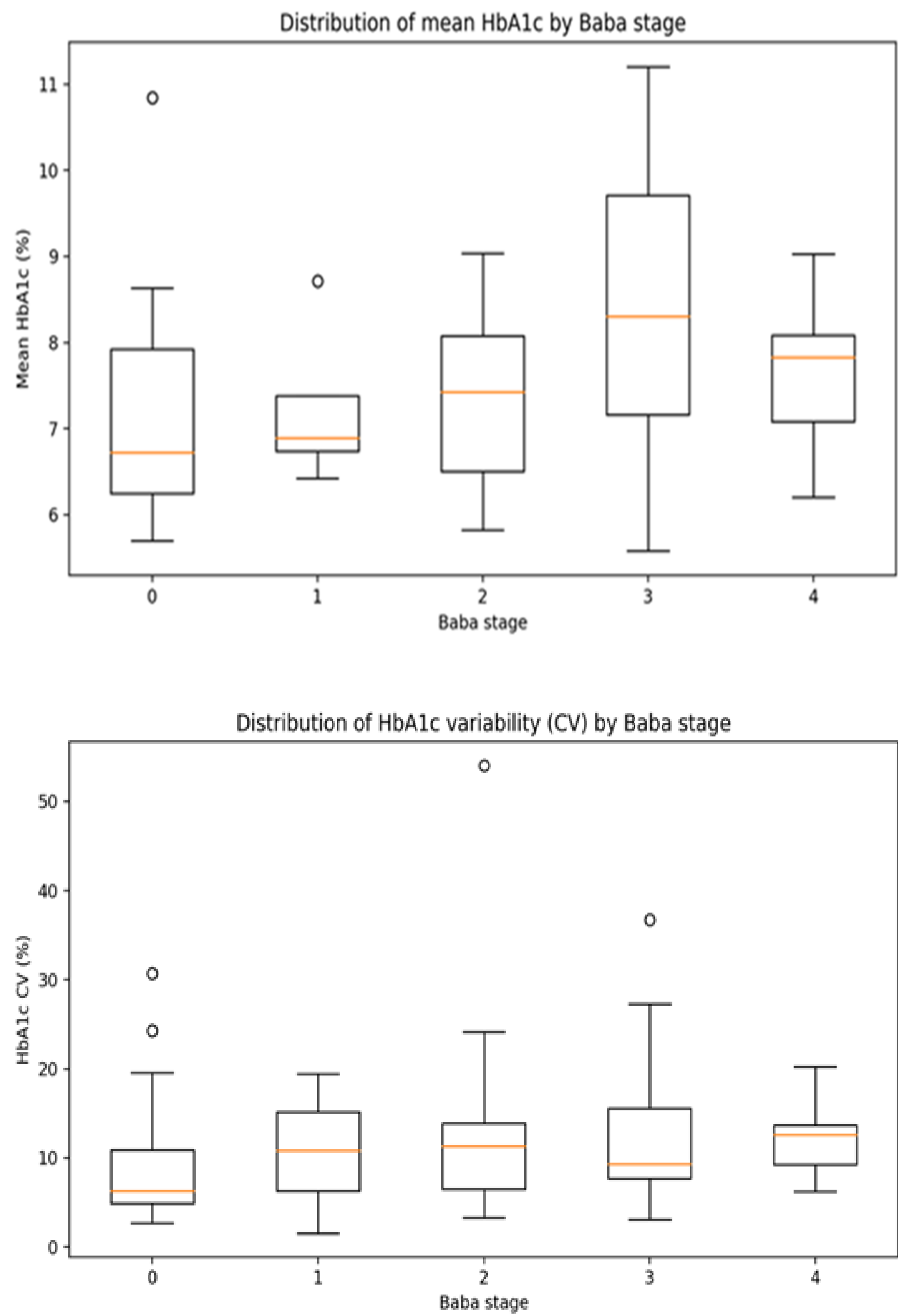
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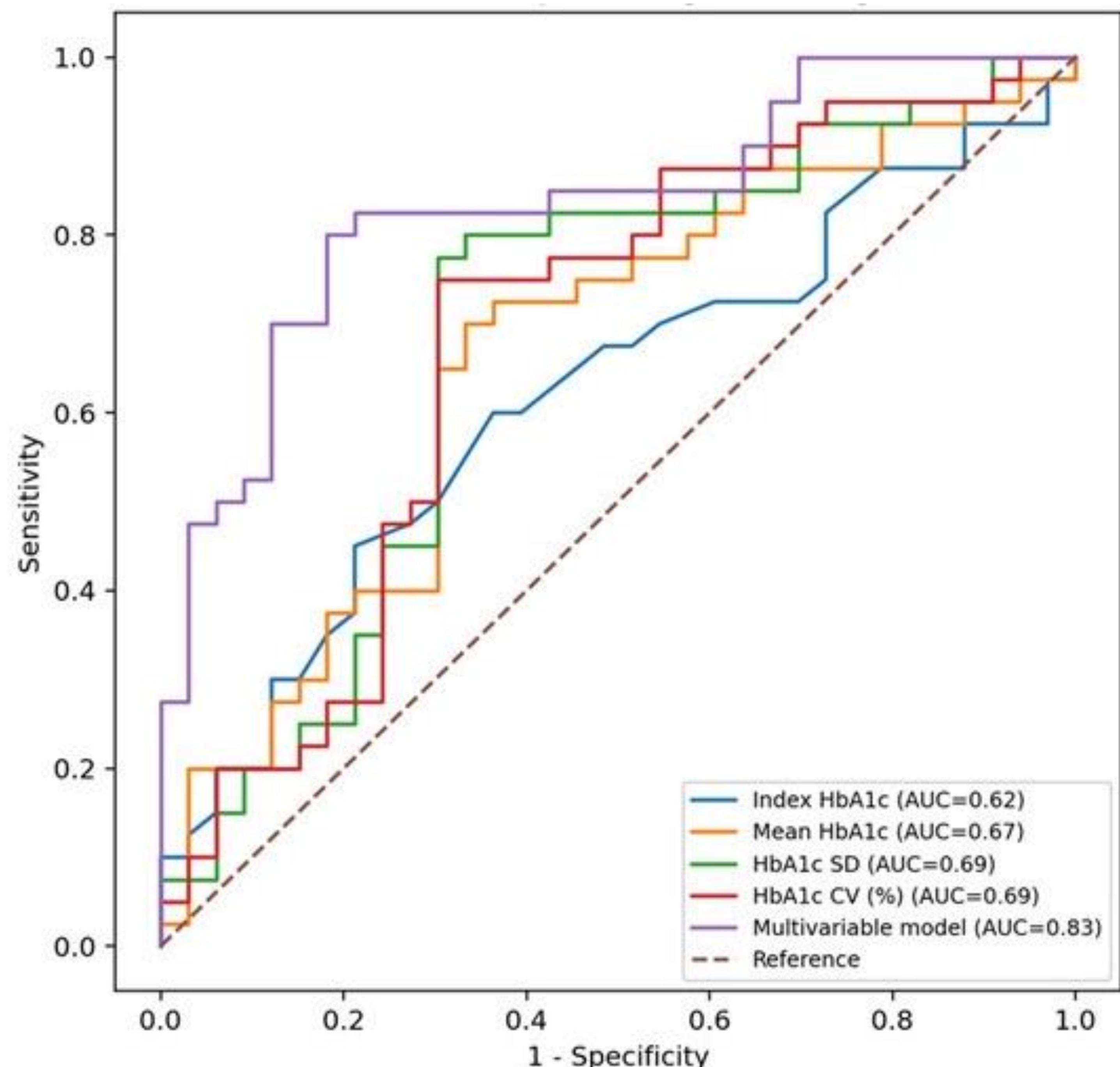
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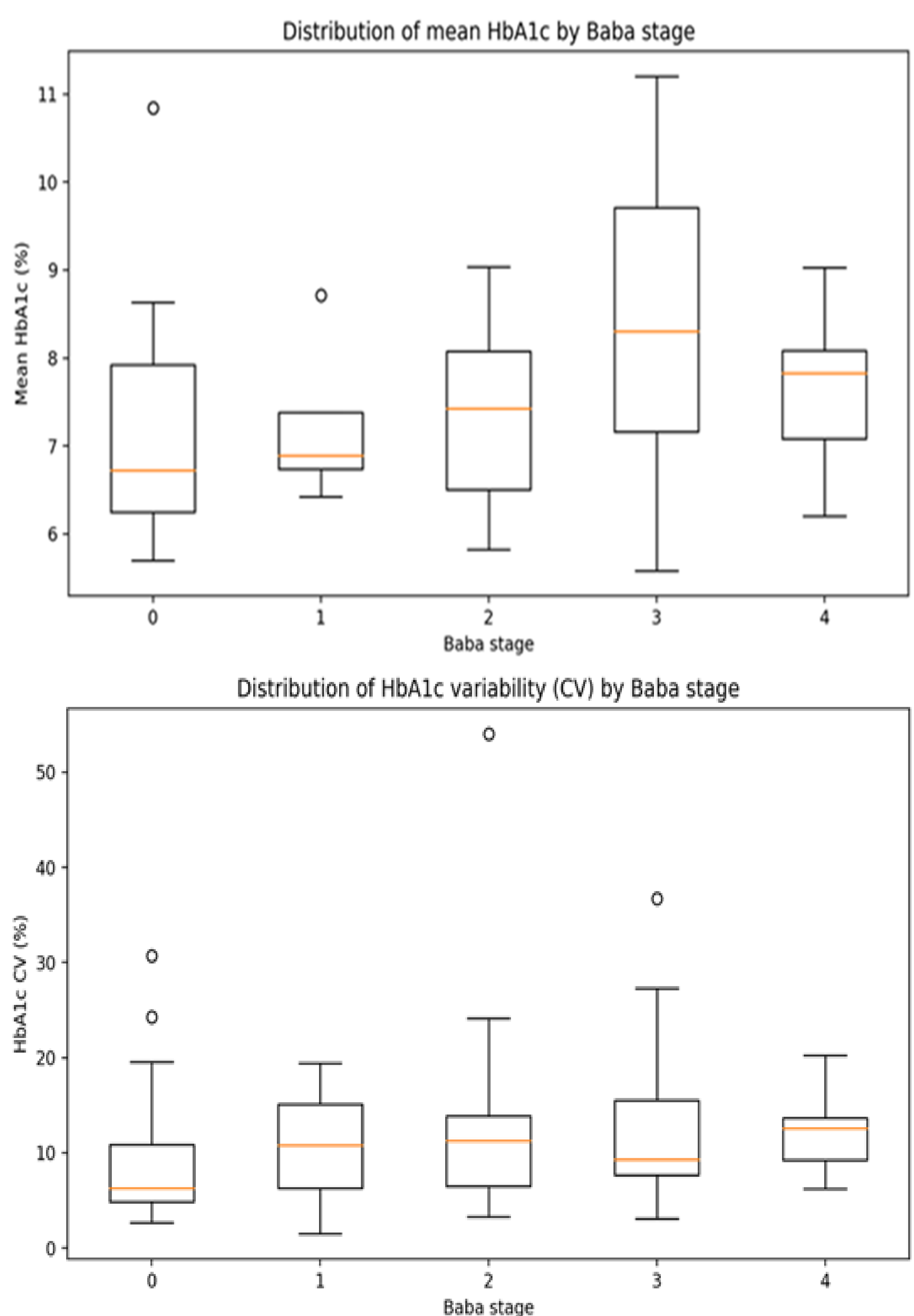
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