The GH-Method

Application of Linear Equation-Based PPG Prediction Model for Four T2D Clinic Cases Based on GH-Method: Math-Physical Medicine (No. 099)

Gerald C. Hsu*

eclaireMD Foundation, USA

Keywords: Type 2 diabetes; Lifestyle; Postprandial plasma glucose; Linear equation

Abbreviations: T2D: type 2 diabetes; PPG: postprandial plasma glucose

1. INTRODUCTION

This paper describes four clinic cases of applying two-parameters linear equation for postprandial plasma glucose (PPG) prediction. The author developed this simplified yet highly accurate equation to predict PPG in order to help type 2 diabetes (T2D) patients on their disease control.

2. METHODS

As described in his previous paper (see Abstract 94), he developed the following linear equation:

PPG = A + (f(x) * B - f(y) * C) * D

Where

f(x) = carbs/sugar intake in grams

f(y) = walking steps in thousands

Variable A = baseline glucose value which indicates patient's stabilized health state of pancreas and liver

B, C, D = 3 different variables which function as multiplier

The author selected four T2D patients with different ages, genders, races, diabetes history, and country of residence (varying lifestyles). Each case of collected PPG data with starting dates are different. Except Case C, all other three cases end on 7/5/2019. For Case C, both measured PPG (missing ~60%) and meal phots (missing ~40%) are scarcely collected after 4/21/2019. Therefore, his data period consists of one year (4/21/2018 - 4/20/2019).

The author used 90-days moving averaged curves for comparison since the PPG moving trends and variance patterns are easily detected. Furthermore, linear accuracy and correlation coefficients of equation-based PPG versus finger-piercing measured PPG are calculated and listed in Table 1.

	Age	Gender	Nation	T2D years
Case A	72	M	A	25
Case B	71	F	A	22
Case C	75	M	T	20
Case D	46	F	M	10
	Period	**Measured Data %**	**Equation Data %**	**Missing Period**
Case A	9/1/15-7/5/19	100%	100%	None
Case B	1/7/19-7/5/19	96%	94%	Almost None
Case C	4/21/18-4/20/19	44%	52%	after 2/2019
Case D	9/11/18-7/5/19	49%	65%	after 2/2019
	Measured (mg/dL)	**Equation (mg/dL)**	**Accuracy (90-days)**	**R (90-days)**
Case A	117.8	117.7	99.9%	75%
Case B	111.4	111.7	99.7%	74%
Case C	151.3	151.8	99.7%	78%
Case D	133.0	133.8	99.4%	88%

Table 1: Background, data integrity, and results of 4 clinic cases.

3. RESULTS

Table 1 and Figures 1-3 show the summarized information of four clinic cases, including their background information, data integrity, analysis results of accuracy and correlation between equation-based PPG prediction versus finger-piercing measured PPG.

Available online: 18 April 2023

*Corresponding author: Gerald C. Hsu, eclaireMD Foundation, USA

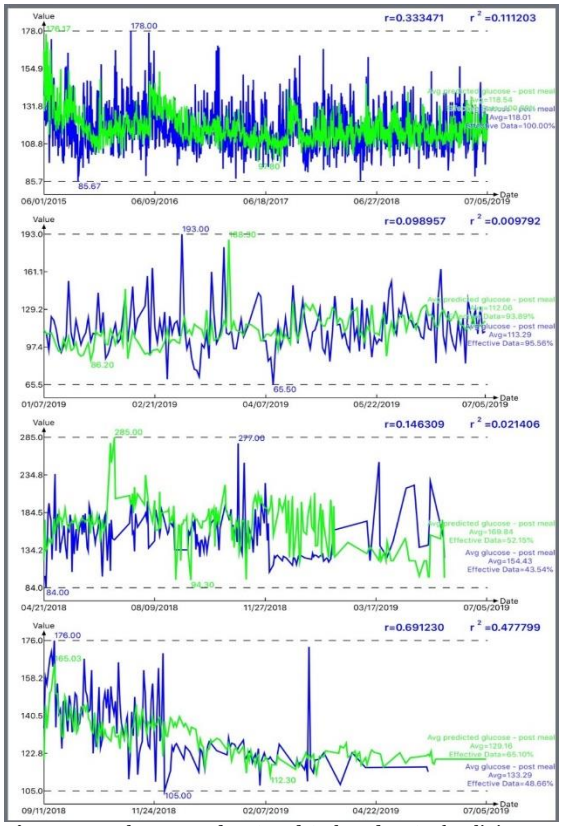

Figure 1: Both measured PPG and AI-based PPG of 4 clinic cases to show data integrity.

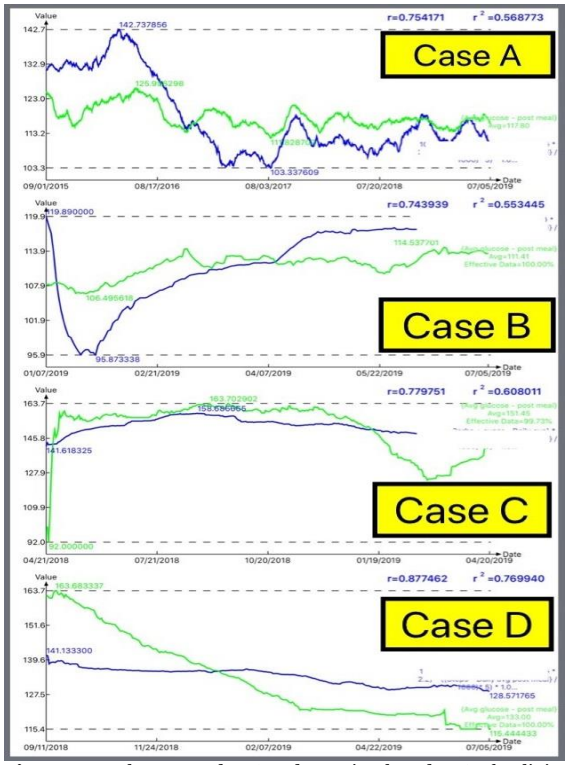

Figure 2: Both measured PPG and equation-based PPG of 4 clinic cases to show accuracy and correlation.

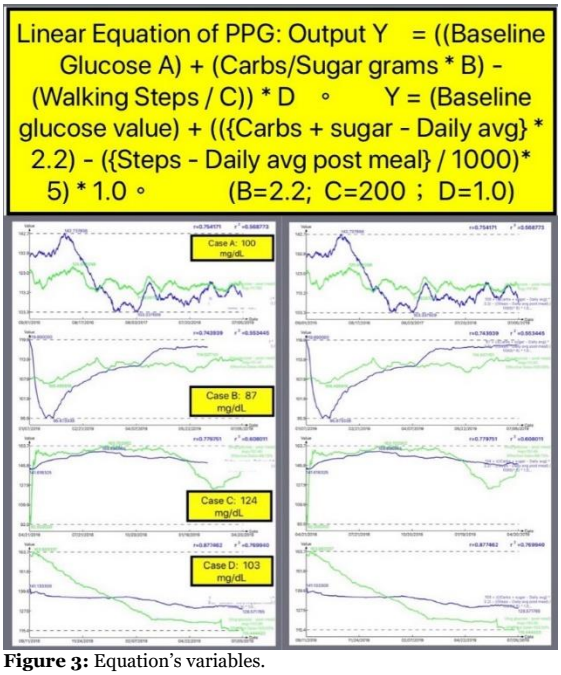

Figure 3: Equation's variables.

(1) Case A: prediction accuracy is 99.9% and correlation is 75%.

(2) Case B: prediction accuracy is 99.7% and correlation is 74%.

(3) Case C: prediction accuracy is 99.7% and correlation is 78%.

(4) Case D: prediction accuracy is 99.4% and correlation is 88%.

4. CONCLUSION

This big data analytics derived two-parameters linear equation of PPG prediction model which is very simple for patients to use, while offering a high accuracy for PPG prediction. Through this study of four clinic cases, the author has proved the validity of this two-parameters linear equation-based PPG prediction model. Over the past five years, he has been continuing his efforts to simplify his glucose prediction models in order to provide a simple and practical tool for T2D patients to use. By offering this streamlined process, the patients will be able to control their diabetes by removing certain psychological resistance or reluctance.

