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Research Article

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Using GH-Method: Math-Physical Medicine to Conduct the Accuracy Comparison of Two different Postprandial Plasma Glucosa Prediction Methods

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Introduction

This paper describes the accuracy of two different methods of postprandial plasma glucose (PPG) prediction in comparison with the actual measured PPG by using the finger-piercing and test-strip (Finger) method. The dataset is provided by the author, who uses his own type 2 diabetes metabolic conditions control, as a case study via the "math-physical medicine" approach of a non-traditional methodology in medical research.

Math-physical medicine (MPM) starts with the observation of the human body's physical phenomena (not biological or chemical characteristics), collecting elements of the disease related data (preferring big data), utilizing applicable engineering modeling techniques, developing appropriate mathematical equations (not just statistical analysis), and finally predicting the direction of the development and control mechanism of the disease.

Method

The author has collected a total of 4,380 PPG data during a period of four years or 1,460 days from 6/1/2015 - 5/31/2019. He self-studied the relationship between diabetes and food nutrition (glucose and carbs/sugar) for nine years. In this analysis, the "carbohydrate and sugar intake amount" is the only key difference, albeit a difficult influential factor, while other variables such as exercise, sleep, stress, water drinking intake are kept identical between these two methods.

The author spent his first two years from 2011-2013 to build-up a large food database containing 6 million cleaned USDA food nutrition data and ~1.6 million re-organized franchise restaurant nutritional database from different public sources. Furthermore, since 5/1/2015, he has kept all of his meal pictures with three to four photos per day, including some snacks and fruits. Thus far, he has collected ~0.5 million personal meal nutritional data. In total, his food and meal database has ~8 million data.

He then defined a new terminology of natural intelligence as "NI" in comparison with artificial intelligence or AI. NI uses two eyeballs to receive a meal picture information and one brain to process all kinds of food information based on the author's past 9-years of study and learning on this subject. Utilizing optical physics and signal processing technique, this AI product is created through computer software programming containing as much as possible of his collected NI information. Of course, the author has also added the auto-learning, auto-judging, and auto-correcting capabilities into his AI software. Based on his nine years of diabetes research and these two different big data analytics approaches of AI and NI, he finally developed a user-based APP, known as the AI Glucometer, for diabetes patients to use in their daily life (see Figure 1).

Figure 1: AI Glucometer

In this accuracy study, he adopted both daily data diagram for better data accuracy and 90-days moving average diagram for better data trend observation and correlation coefficient study.

Results

Listed below are summaries of his findings (see Figure 2):

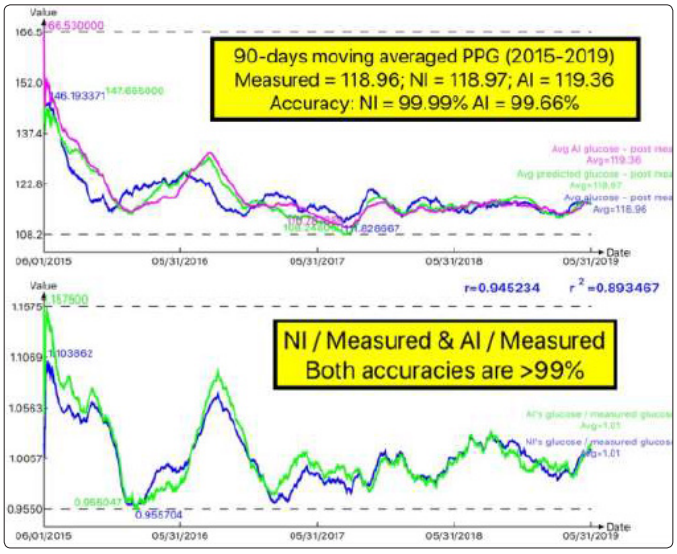

Figure 2: NI and AI Comparison against Actual measured PPG (6/1/2015 - 5/31/2019)

Finger measured PPG: 118.96 mg/dL
NI predicted PPG: 118.97 mg/dL
AI predicted PPG: 119.36 mg/dL
Accuracy of NI vs measured: 99.99%
Accuracy of AI vs measured: 99.66%
Correlation Coefficient of NI vs. AI: 94.5%

Conclusion

The author observed AI and NI results with a similar pattern but his NI accuracy is still 0.33% higher than his AI accuracy. This makes sense since his NI knowledge created his AI tool. Nevertheless, with a 99.66% high AI accuracy, his developed AI Glucometer could be used as a practical and useful tool for T2D patients to control their diabetes conditions without cumbersome, painful, and costly traditional glucose testing methods. This is another good example of what and how AI technology can contribute to medicine.

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