



Clinical Case B Using Big Data Analytics and Spatial Analysis to Investigate the Triangular Dual-Correlations among Weight, Glucose, and Blood Pressure (Using GH-Method: Math-Physical Medicine)

Gerald C Hsu*

eclairMD Foundation, USA

*Corresponding Author: Gerald C Hsu, eclairMD Foundation, USA.

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Introduction

The author uses the GH-Method: math-physical medicine approach to investigate the following three sets of dual-relationship among the three metabolic parameters:

1. Weight vs. glucose
2. Weight vs. BP
3. Glucose vs. BP.

Method

The selected time period is from 2/1/2014 - 1/6/2019 with big data of ~18,000 metabolic conditions (weight, BP and glucose). This paper utilized both time-series and spatial analysis to investigate their correlations.

Results

From the time-series analysis, Clinical Case B shows that there is no correlation existing between weight vs. glucose and weight vs. BP; however, there is a moderately strong correlation (45%) existing between glucose and BP.

However, the author has noticed the following facts by mining this particular patient's data in terms of data cloud's shape and orientation from spatial analysis:

1. The patient is an overweight female with BMI of 26 (146 lbs.) to 29 (164 lbs.). She has been overweight throughout the entire investigation period and she does not take any medication for weight control.
2. She has three metabolic disorders for over 20 years, including diabetes, hypertension, and hyperlipidemia. She has continuously taken medications for controlling these three metabolic conditions.
3. She has been careful about her carbs/sugar intake and exercise. However, she has ignored her food portion, particularly snacking between meals, which is the main cause of her overweight problem. Being overweight is her major health threat.

4. Her spatial analysis data between glucose and BP are clustered into a football shape. This phenomenon is caused by an effective control via medications for her diabetes and hypertension. All of her metabolic conditions data points are confined within a smaller football-shaped area due to a combination of partial lifestyle management and effective medication plan. Therefore, not much of the data points (<2%) have leaked out of the confined area.
5. Her data diagram for both weight vs. glucose and weight vs. BP is a slender and horizontal cucumber shape. The horizontal orientation indicates her glucose and BP data are invariant with her weight change due to her effective medication plan. In addition, the slender thickness of data band means both of her glucose and BP values are very well under control by her medications. There is 87% of her glucose values within the range of 90 mg/dL to 142 mg/dL; whereas, 98% of her BP values are within the boundary of 72% to 108% of the normal range for 80 mmHG for DBP and 120 mmHG for SBP.
6. One interesting observation is that the correlation between glucose and BP is moderately strong (45%) despite her diabetes medication being different from her hypertension medication [1-5].

Conclusion

This specific clinical case shows that medications are effective in controlling her chronic diseases in combined with her partial effort of lifestyle management. However, her being overweight still represents risk on her overall health. This paper doesn't have any new discovery; however, by using the GH-Method: math-physical medicine approach, it provides some additional mathematical proof and quantitative evidence of metabolic disorder control via a combination of both effective medication plan and lifestyle management.

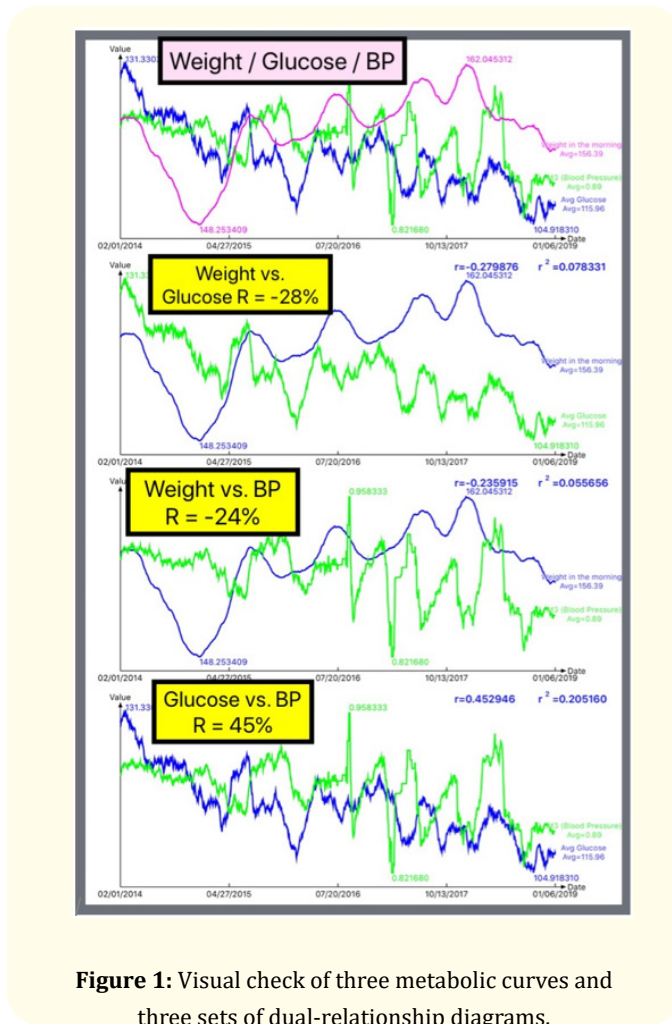


Figure 1: Visual check of three metabolic curves and three sets of dual-relationship diagrams.

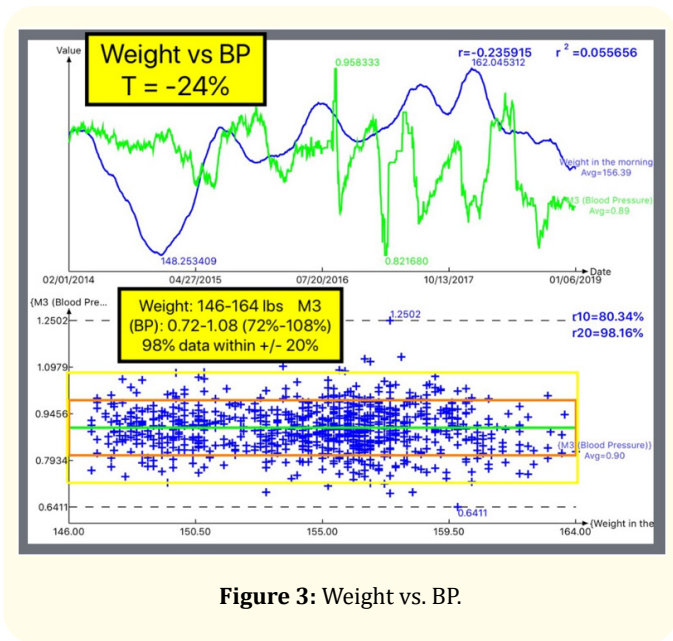


Figure 3: Weight vs. BP.

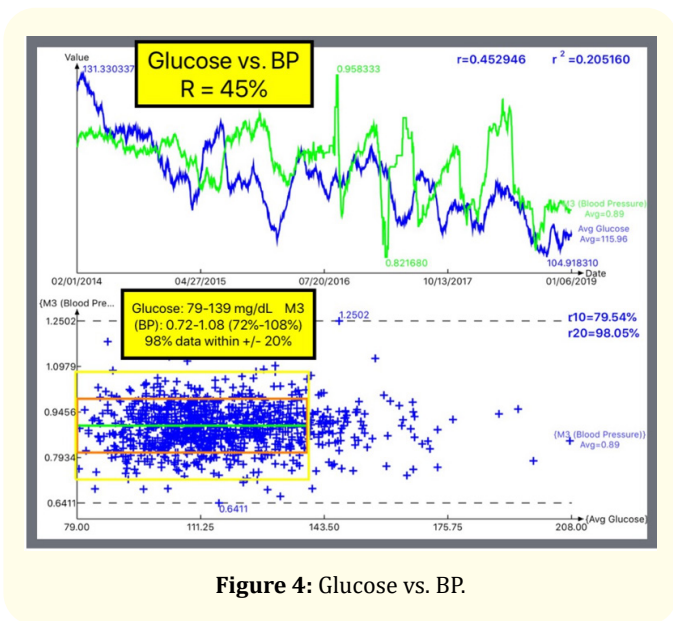


Figure 4: Glucose vs. BP.

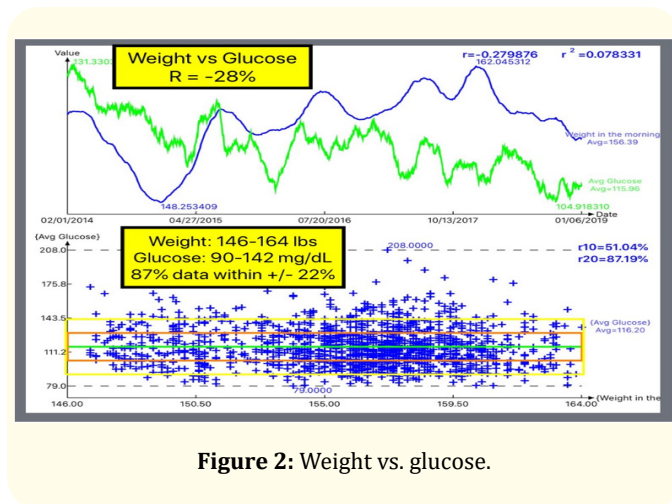


Figure 2: Weight vs. glucose.

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