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Research Article

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Estimation of Organ Impact by Relative Energy Associated with Higher-Frequency Glucose Components using GH-Method: Math-Physical Medicine (No. 290)

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Abstract

This paper describes the author's estimation of the relative energy associated with higher-frequency glucose components. During this research, he attempted to develop a simplified yet practical "equation" for calculating his estimated relative energy. His ultimate goal is to identify the degree of impact or damage to the human internal organs due to excessive energy caused by hyperglycemia in diabetes patients. He has applied his developed GH-Method: math-physical medicine (MPM) approach to conduct this medical research.

By using his own ~33,000 glucose data for the past 129 days; he has identified ~20% of relative glucose energy associated with higher-frequency glucose components, which is 67% of the total frequency numbers.

The comparison ratios between low frequency with high amplitude glucoses versus high frequency with low amplitude glucoses are summarized as follows:

Energy (E) Ratio:
4 to 1

Frequency Numbers (n) Ratio:
1 to 2

Frequency Amplitude Square (a*a) Ratio:
8 to 1

This research project requires using Bluetooth technology to collect bigger sets of glucose data (3x more data) which allows him to identify ~20% of possible impact or damage to the internal organs resulting from the relative energy associated with high-frequency glucose components. This finding can serve as a starting point for his future research on various diabetic complications.

Introduction

This paper describes the author's estimation of the relative energy associated with higher-frequency glucose components. During this research, he attempted to develop a simplified yet practical "equation" for his estimated relative energy. His ultimate goal is to identify the degree of impact or damage to the human internal organs due to excessive energy caused by hyperglycemia in diabetes patients. He has applied his developed GH-Method: math-physical medicine approach (MPM) to conduct this medical research.

Methods

Background

The author majored in mathematics, physics, engineering, and computer science in college. After college, he worked in various industries, including space, defense, nuclear, and power, computer and information technology (IT), semiconductors and artificial intelligence (AI), where he utilized many of his learned basic concepts and academic theories on different challenging industrial applications.

He has had type 2 diabetes (T2D) since 1995. In 2010, he suffered five cardiovascular episodes and many other diabetic complications, including bladder infections, kidney disorder, foot ulcer, neuropathy, diabetic retinopathy, and hypothyroidism. Three physicians warned him about the severity of his chronic diseases and related conditions with the possibility of an early death around 65 years old. Facing the immediate threat of dialysis treatments, he finally woke up and decided to save his own life via his own efforts. Since 2010, he has immersed himself into self-study and research on diabetes and its complications with a special focus on glucose and metabolism. Based on his acquired medical knowledge, he realized that glucose is the primary criminal, while blood pressure and lipids are the accomplices. Combining them together would inflict different degrees of damage to most of the internal organs through the blood circulatory system. However, another broad topic of "metabolism" is far more important than the individual factors related to health. In Figure 1, moving from the inner circle towards the outer rings, this depicts the stringent lifestyle management leading into a good metabolic state, and then converting into a strong immunity to fight against three major disease categories, chronic diseases and complications (~50% of death), cancers (~29% of death), and infectious diseases (~11% of death), except for the remaining ~10% of non-diseases related death cases. This is a logical pathway to achieve overall health conditions, including diabetes control [1].

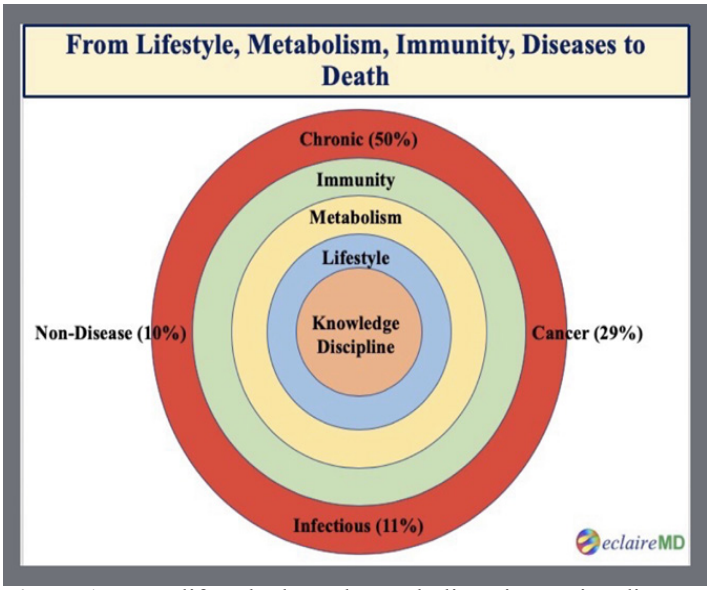

Figure 1: From lifestyle through metabolism, immunity, diseases and death

Data Collection

Since 1/1/2012, the author measured his glucose values using the finger-piercing method: once for FPG and three times for PPG each day. On 5/5/2018, he applied a continuous glucose monitoring (CGM) sensor device (Freestyle Libre) on his upper arm and checked his glucose measurements every 15 minutes, a total of ~80 times each day. After the first bite of his meal, he measured his postprandial plasma glucose (PPG) level every 15 minutes for a total of 3-hours or 180 minutes. He has maintained the same measurement pattern during all of his waking hours. However, during his sleeping hours (00:00-07:00), he measured his fasting plasma glucose (FPG) in one-hour intervals.

Starting from 2/19/2020, he has conducted a new experiment on his body. He utilized a hardware device based on Bluetooth technology and embedded with his customized application software to automatically transmit all of his CGM collected glucose data (both 5-minute and 15-minute intervals) from the Libre sensor directly into his developed research application program known as the "eclaireMD system". The data transmission of his glucose values at each "5-minute" time interval would continuously go through the entire day; therefore, he is able to collect ~240 glucose data within 24 hours. With such a bigger set of glucose data, it contains both lower frequency and higher frequency glucose components.

He used the past 4+ months from 2/19/2020 to 6/27/2020 (129 days), as his research period for analyzing the relative energy associated with the lower frequency and higher frequency glucose components.

Data Analysis Using Wave Theory

The biomedical glucose waves are similar to all kinds of waves in nature, such as earthquake, tsunami, light, sound, and electronics with their respective carried energies. In his previous industrial work, he studied and investigated the damages to structures and equipment caused by various earthquakes on many nuclear power plants worldwide. The earthquake wave itself is not the direct "murderer", but the energy associated with earthquake wave, i.e., forces, is the true killer, which brings damage to the structures and equipment. The initial impact from this wave can cause severe destruction or instant collapse for some buildings and structures. Although certain structures could still survive through the initial impact of force, i.e., energy, they have already suffered from internal damages, such as cracks. As a result, when more earthquake waves carry their energies by continuously hitting the damaged building or structure, they eventually can cause the ultimate structural collapse or equipment failures.

The structural damage from energy associated with earthquake wave is remarkably similar to the human organ impact and damage from the energy associated with the glucose wave. The internal organs of a diabetes patient, who has been suffering from hyperglycemia for a long period of time, have already sustained different degrees of damage caused by the daily high glucose wave's energy. Sooner or later, some of these affected organs can cause serious complications and face destruction.

Based on physics, the wave's energy is directly proportional to the square of the amplitude of a wave. Therefore, the author made an attempt to develop a simple yet practical equation using the multiplication of "a2" or "square of amplitude" and "n" or the number of data points within a range of glucose wave, to represent this "glucose energy".

Here is the proposed equation of estimated relative energy associated with glucose components within certain frequency range known as the ***equation of glucose energy***:

$$E = na2$$

Where E is relative glucose energy, n is the number of glucose components of a wave, and a is the "average amplitude" of frequency domain's Y-coordinates which is proportional to the square

of glucose value. Here, the **average amplitude**, a, is defined as follow:

$$a = (\Sigma Ai) / n$$
$$i=1$$

Where A is the individual amplitude and n is the upper limit of glucose component numbers.

The author further validated this theoretically derived simple "glucose energy equation" by using the real clinical data collected from his own body during the past 129 days (2/19/2020 - 6/27/2020).

Results

Figure 2 shows his 15-minute "synthesized" sensor glucose wave over the course of a day (x-scale: 24 hours). Synthesized means that the final wave is the combination of 129 days (from 2/19/2020 through 6/27/2020) average glucose waves. This Figure 2 also includes his synthesized 5-minute wave and the comparison chart of these two time-domain daily glucose waves, 5-minutes vs. 15-minutes.

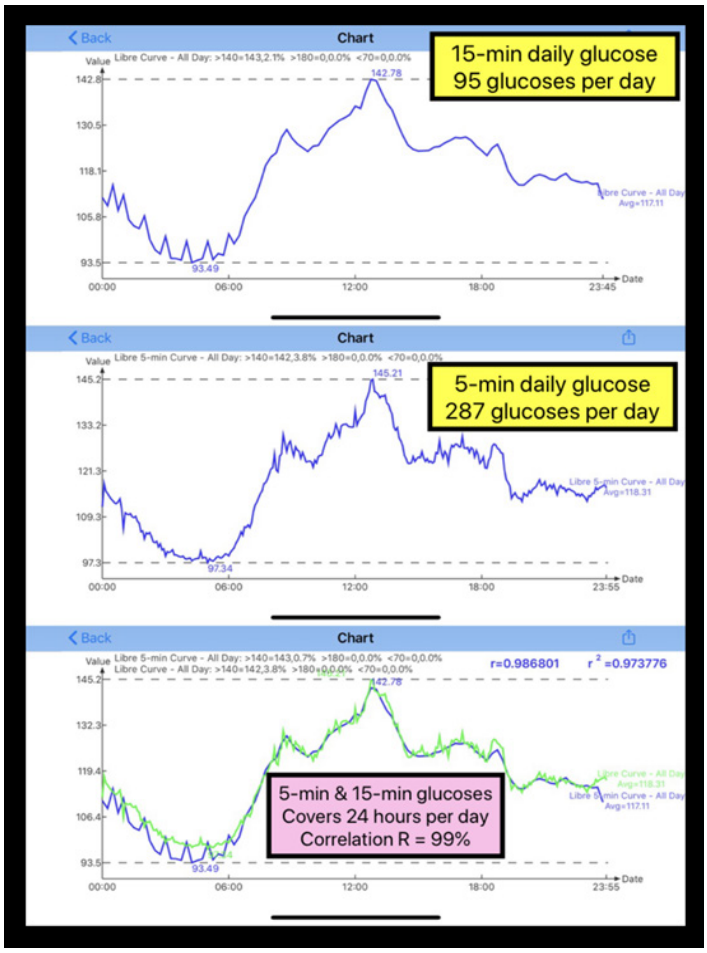

Figure 2: Time-domain daily glucose waves (15-minutes, 5-minutes, and comparison)

From this figure, it is obvious that there are more higher frequency glucose components in the 5-minute wave due to availability of three times more the collected number of glucose data points. The extremely high correlation coefficient of 99% existing between the 5-minute time-domain wave and 15-minute time-domain wave means that these two measured waveforms are extremely similar in shape, except for the 5-minute wave containing more glucose components, especially including some higher frequency glucose components.

The author then enhanced his customized applications program, the eclaireMD software system, to include the Fourier transform operation, frequency domain analysis, wave theory applications, and relative glucose energy calculations using his developed "equation of glucose energy: E=na2". The conclusive results are shown in a bar chart of comparison of energy distribution percentages (Figure 3).

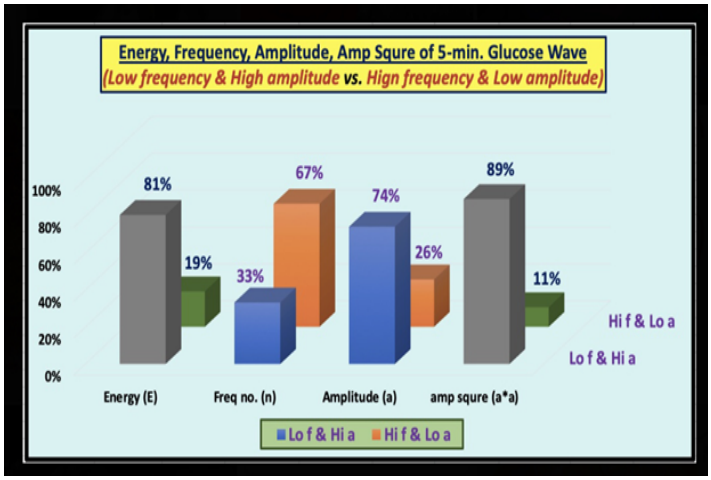

Figure 3: Distribution percentage of Energy, Frequency number, Frequency Domain Amplitude, & Amplitude Square

He has defined the frequency band of lower frequency with higher amplitude (Lo f & Hi a) as 0 to 48 (n=48) and the frequency band of higher frequency with lower amplitude (Hi f & Lo a) as 48 to 144 (n=96). The calculated distribution percentage of relative glucose energy for these two frequency bands are listed as follows:

Lo f & Hi a: 81%
Hi f & Lo a: 19%

Furthermore, he also calculated the following **distribution percentages of values of glucose amplitude square (a*a):**

Lo f & Hi a: 89%
Hi f & Lo a: 11%

The comparison ratio between two relative glucose energies (E), 81% versus 19%, is about 4 to 1. The comparison ratio between the numbers of chosen higher frequency component number (n) of 96 (67% or two thirds) versus the lower-frequency component number (n) of 48 (33% or one third), is exactly 2 to 1. The comparison ratio of glucose energy (E), 81% versus 19% is around 4 to 1. The following simple arithmetic calculation can depict the rela-

tionships among these three sets of data.

Lo f & Hi a (Y%*X%) / Hi f & Lo a (Y%*X%): i.e. Ratio of a2 * n
= (89*33.3) / (11*66.7)
= 4 / 1
= 81 /19: i.e., ratio of energy

By transforming into energy, glucose delivers the nutritional supply to the body. In theory, hyperglycemia is elevated glucose that provides excess "energy" more than the body needs. When the body cannot burn off all of the produced and stored energy, the excessive "left-over" energy circulating in the bloodstream will eventually cause different degrees of damage to the internal organs. This is the author's interpretation based on physics regarding why elderly people, who have excessive glucose energy, are most likely suffering from diabetes complications. An effective way to control diabetes conditions for people of all ages can be completed in two simple steps: First, eat less (provide less fuel) and second, exercise more (burn off more energy).

This MPM research approach provides a few reasonable but accurate answers for various biomedical problems.

Conclusions

By using his own ~33,000 glucose data for the past 129 days; he has identified ~20% of relative glucose energy associated with higher-frequency glucose components, which is 67% of the total frequency numbers.

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Acknowledgement

Foremost, I would like to express my deep appreciation to my former professors: professor James Andrews at the University of lowa, who helped develop my foundation in basic engineering and computer science, and professor Norman Jones at the Massachusetts Institute of Technology, who taught me how to solve tough scientific problem through the right attitude and methodology.

References

1. Hsu Gerald C (2020) Risk probability of having a metabolic disorder induced cancer using GH-Method: MPM (No. 263). Journal of Cancer Science and Research 5: 1-5.
2. Hsu Gerald C (2019) Using GH-Method: Math-Physical Medicine, Fourier Transform, and Frequency Segmentation Pattern Analysis to Investigate Relative Energy Associated with Glucose (No. 82). Medical & Clinical Research 5: 33-34.
3. Hsu Gerald C (2019) Applying first-order perturbation theory of quantum mechanics to predict and build a postprandial plasma glucose waveform via GH-Method: math-physical medicine (No. 152). Journal of Geriatric Research 4.
4. Hsu Gerald C (2020) Differences between 5-minute and 15-minute measurement time intervals of the CGM sensor glucoses device using GH-Method: math-physical medicine (No.281). Internal Medicine Research Open Journal 5: 1-4.
5. Hsu Gerald C (2020) Estimated relative energy level of four different Finger PPG ranges using wave theory and frequency domain analysis via GH-Method: math-physical medicine (No. 272).
6. Hsu Gerald C (2020) Using glucose and its associated energy to study the risk probability percentage of having a stroke or cardiovascular diseases from 2018 through 2020 via GH-Method: math-physical medicine (No. 273).