Special Issue 2
2021

https://www.theghmethod.com

The GH-Method

Comparison of CVD/Stroke Risk Percentage Changes Between Normal Diet and High-Carb Diet in 2020 Based on GH-Method: Math-Physical Medicine (No. 434)

Gerald C. Hsu*

eclaireMD Foundation, USA

Abstract

The author is a mathematician and engineer by training; therefore, he can describe a phenomenon or answer a question using numerical numbers and providing a precise description, not just through linguistic expressions with qualitative words, vague statements, or complex medical terminologies. Recently, he saw a question on ResearchGate seeking responses or comments for the following question: "Do you agree that a high carbohydrate diet may cause heart problems (cardiovascular disease or CVD)?" He read about 30 out of the 130 comments posted, where these responses contain correct information. Most of them included a similar style of opinion. One of the comments is provided below to show the expression style, which is a quality response and an informative answer. "In most of the communities, the diet contains more carbohydrates than protein and fat. More carbohydrate after catabolism produces more saturated fatty acids. This may disturb the level of LDL (high) and lead to atherosclerosis." Here is his response on ResearchGate: "Using math-physical medicine and based on Y2020 data of one type 2 diabetes (T2D) patient, it has been identified that the risk probability % of having a cardiovascular disease (CVD) has been increased by 8% between the 53% risk from 14 grams of carbs intake per meal and the 61% risk from 70 grams of carbs intake per meal". Both the answers from the author and others are equally correct and informative but with different styles of message description and expression of opinion.

Due to this small incident, the author decided to write all the details of his analysis work, which includes the detailed data and truths behind the above-mentioned conclusions in this short article. With a summary of conclusive outlooks, after he converted his complex mathematical model of CVD/stroke risk assessment into a computer software in 2020, the future tasks of exploring the risk levels of having a CVD/stroke when certain input situations change, such as carbs/sugar intake amounts, will become easier for a patient with chronic diseases to use. This rehearsal of the "what-if" scenario among the three key areas that include lifestyle details, existing medical condition changes, and probability or severity of future disease complication is exceedingly beneficial for patients in controlling their risk of having a complication before it occurs. Over the past 11 years, he has continuously investigated, studied, and analyzed the collection of ~2 million data regarding his health status, medical conditions, and lifestyle details. He applies his physics knowledge, engineering models, mathematical tools, and computer programming to conduct his medical research. His entire medical research work is based on the aim of achieving high precision with quantitative proof in biomedical findings. His personal goal is to save his own life through research and then help his family members along with the other patients by distributing his learned knowledge and experiences gained from his 11-years of medical research work to combat these chronic diseases and complications at the root cause level.

Keywords: Cardiovascular disease; Stroke; Diet; Carbohydrate; Glucose

Abbreviations: CVD: cardiovascular disease; T2D: type 2 diabetes; MPM: math-physical medicine; BCM: biochemical medicine; MI: metabolism index; GHSU: general health status unit; CKD: chronic kidney disease; PPG: postprandial plasma glucose; FPG: fasting plasma glucose; HbA1C: hemoglobin A1c; CGM: continuous glucose monitoring

Received: 11 August 2021, Accepted: 16 September 2021, Available online: 20 September 2021

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

1. INTRODUCTION

The author is a mathematician and engineer by training. Therefore, he can describe a phenomenon or answer a question using numerical numbers and providing a precise description, not just through linguistic expressions with qualitative words, vague statements, or complex medical terminologies.

Recently, he saw a question on ResearchGate seeking responses or comments for the following question:

"Do you agree that a high carbohydrate diet may cause heart problems (cardiovascular disease or CVD)?"

He read about 30 out of the 130 comments posted, where these responses contain correct information. Most of them included a similar style of opinion. One of the comments is provided below to show the expression style, which is a quality response and an informative answer.

"In most of the communities, the diet contains more carbohydrates than protein and fat. More carbohydrate after catabolism produces more saturated fatty acids. This may disturb the level of LDL (high) and lead to atherosclerosis."

Here is his response on ResearchGate:

"Using math-physical medicine and based on Y2020 data of one type 2 diabetes (T2D) patient, it has been identified that the risk probability % of having a cardiovascular disease (CVD) has been increased by 8% between the 53% risk from 14 grams of carbs intake per meal and the 61% risk from 70 grams of carbs intake per meal."

Both the answers from the author and others are equally correct and informative but with different styles of message description and expression of opinion.

Due to this small incident, the author decided to write all the details of his analysis work, which includes the detailed data and truths behind the above-mentioned conclusions in this short article.

2. METHODS

2.1 MPM background

To learn more about his developed GH-method: math-physical medicine (MPM) methodology, readers can read the following three papers selected from the published 400+ medical papers.

The first paper, No. 386 describes his MPM methodology in a general conceptual format[1]. The second paper, No. 387 outlines the history of his personalized diabetes research, various application tools, and the differences between the biochemical medicine (BCM) approach vs. the MPM approach[2]. The third paper, No. 397 depicts a general flow diagram containing ~10 key MPM research methods and different tools[3].

2.2 CVD/stroke risk model based on metabolism

In 2014, the author applied the topology concept, finite-element engineering technique, and non-linear algebra operations to develop a complex mathematical model of metabolism. This model contains 10 categories, including four output categories (weight, glucose, blood pressure, and lipids), and six input categories (food, water intake, exercise, sleep, stress, and routine life patterns). These 10 categories are comprised of approximately 500 detailed elements. He also defined two new parameters: metabolism index (MI), as the combined score of the above 10 metabolism categories and 500 elements along with the general health status unit (GHSU), as the 90-days moving average value of MI. Since 2012, he has collected more than 2 million data of his own biomedical conditions and personal lifestyle details.

Following the mathematical metabolism model, he further developed a series of models regarding diabetic complications which contain some detailed equations to predict his risk probabilities of having a stroke, CVD, chronic kidney disease (CKD), and pancreatic beta-cells self-recovering assessment[4-8]. These risk assessment models include a patient's baseline data including age, race, gender, family genetic history, medical history, and bad habits which contribute approximately 20% of the

total risk. Furthermore, it also includes the following two major areas each with a 40% contribution:

(1) Medical conditions - individual M1 through M4 include obesity, diabetes, hypertension, hyperlipidemia, and others. It should be emphasized here that diabetes (i.e., glucose) alone contributes about 20% of the total risk.
(2) Lifestyle details - individual M5 through M10 which affect the medical conditions.

In addition, he also uses his defined two terms, MI and GHSU, as a combined score of M1 through M10 and 90-days moving average MI for his calculation. Of course, all of these 10 metabolism factors (M1 through M10) are interrelated.

With this mathematical risk assessment model, he can obtain three separate risk probability percentages associated with each of the three calculations mentioned above. As a result, this model would offer a range of the risk probability predictions of having a CVD or stroke based on the patient's metabolic disorder conditions, unhealthy lifestyles, and the combined impact on the body[9,10].

2.3 The author's diabetes history

The author was a severe T2D patient since 1996. He weighed 220 lb. (100 kg) at that time. By 2010, he still weighed 198 lb. with average daily glucose of 250 mg/dL (HbA1C at 10%). During that year, his triglycerides reached 1161 (high risk for CVD and stroke) and the albumin-creatinine ratio (ACR) at 116 (high risk for CKD). He also suffered from five cardiac episodes within a decade. In 2010, three independent physicians warned him regarding the need for kidney dialysis treatment and the future high risk of dying from his severe diabetic complications.

In 2010, he decided to self-study endocrinology with an emphasis on diabetes and food nutrition. During 2015 and 2016, he developed four mathematical prediction models related to diabetes conditions: weight, postprandial plasma glucose (PPG), fasting plasma glucose (FPG), and HbA1C (A1C). By using his developed mathematical MI model and the other four glucose prediction tools, by the end of 2016, his weight was reduced from 220 lbs. (100 kg) to 176 lbs. (89 kg), waistline from 44 inches (112 cm) to 33 inches (84 cm), average finger-piercing glucose from 250 mg/dL to 120 mg/dL, and A1C from 10% to ~6.5%. One of his major accomplishments is that he no longer takes any diabetes-related medications since 12/8/2015[11-13].

In 2017, he had achieved excellent results on all fronts, especially his glucose control. However, during the pre-COVID period, including both 2018 and 2019, he traveled to ~50 international cities to attend 65+ medical conferences and made ~120 oral presentations. This hectic schedule inflicted damage to his diabetes control caused by stress, dining out frequently, post-meal exercise disruption, jet lag, along with the overall negative metabolic impact from the irregular life patterns; therefore, his glucose control was somewhat affected during the two-year traveling period of 2018-2019.

He started his self-quarantined life on 1/19/2020. By now, 4/10/2021, his weight was further reduced to ~165 lbs. (BMI 24.4) and his A1C was at 6.2% without any medication intervention or insulin injection. In fact, with the special COVID-19 quarantine lifestyle since early 2020, not only has he written 200 new research articles and published a total of 400 medical papers in various medical and engineering journals, but he has also achieved his best health conditions for the past 26 years. These achievements have resulted from his non-traveling, low-stress, and regular daily life routines. Of course, his in-depth knowledge of chronic diseases, sufficient practical lifestyle management experiences, and his own developed high-tech tools have also contributed to his excellent health improvements[14-17].

On 5/5/2018, he applied a continuous glucose monitoring (CGM) sensor device on his upper arm and checks his glucose measurements every 5 minutes for a total of 288 times each day. Furthermore, he has extracted the 5-minute intervals into every 15-minute interval and stored the 96-glucose data each day into his computer software.

3. RESULTS

3.1 ResearchGate question and part of responses

This section is a combined excerpt from ResearchGate involving the original question along with some responses or comments.

Question:
"Do you agree that a high carbohydrate diet may cause heart problems (cardiovascular disease)?"

Responses and comments:
"In most of the communities, especially those owned by lower socioeconomic status, the diet contains more carbohydrates than protein and fat. More carbohydrate after catabolism produces more saturated fatty acids. This may disturb the level of LDL (high) and lead to atherosclerosis.

Diet contains more carbohydrates than protein and fat. More carbohydrate after catabolism produces more saturated fatty acids. This may disturb the level of LDL (high) and lead to atherosclerosis.

Many people depend heavily on eating carbohydrates in their meals, yes, there are many studies that confirm the relationship between eating a high carbohydrate diet and heart disease but we must be more accurate in determining which type of carbohydrates cause this problem, there is the type of refined which contributes to raising the level of unwanted fats in the blood, such as white bread. As for the good type which contains fiber, which in turn regulates the rate of fats in the blood such as whole grains, oats, and others made from the bran, so the issue depends on our correct choice of foods from this group.

Yes, eating carbohydrates such as fruits, vegetables, and nuts, etc. is not the problem. It is the overconsumption of refined carbohydrates, most prominently flour and sugar which is the problem.

Yes, I do agree. Diet is an important risk factor in coronary heart disease. Food-related risk factors include obesity, high blood pressure, uncontrolled diabetes, and a diet high in saturated fats. A low-saturated fat, high-fiber, high plant food diet can substantially reduce the risk.

Yes, I agree that over-consumption of these kinds of food can be problematic with regard to CVD.

Yes, I agree because diet certainly plays a big role in causing CVD."

3.2 Explanation of input data

The author has collected 288 glucose data per day (every 5 minutes) and extracted 96 glucose data per day (every 15 minutes) from the CGM sensor device and entered the information into his computer software since 5/5/2018. For 365 days in 2020, he collected 35,040 sensor glucose data from his 15-minute model for this specific project.

For this particular study, he divided his data into two groups: the total group of 365 days having 1,088 meals with average carbs of 13.7 grams per meal; and the high-carbs group of 32 meals with average carbs of 70.4 grams per meal ranging from 50 grams to 150 grams. The post-meal walking steps are comparable with 4,463 steps for the total group and 4,881 steps for the high-carbs group.

Although his high-carb meals only occupy ~3% of his total meals, he can calculate the differences of their associated PPG and daily glucose levels from each group. He uses 75% as the weight factor of PPG and 25% as the weight factor of FPG in his daily glucose calculation. His FPG levels of 102 mg/dL are the same for both the total group and the high-carbs group.

After he determines the difference in the daily average glucose between the two groups, he can calculate the changes of his medical condition's metabolism index 2 (M2) which is glucose-related metabolism. He also inserts the different carbs/sugar intake amounts, i.e., 13.7 grams for the total group and 70.4 grams for the high-carbs group in his lifestyle's metabolism index 9 (M9) which is food and meals related metabolism. Although he has been under a stringent diet plan to control his diabetes since 2015, he still needed to pay a severe penalty for the high-carb intake amount. It should be noted here that he designed his model this way in order to help users to control their lifestyles. Fortunately, the high-carb group only occupies 3% of his total meals; otherwise, his health will be ruined by continuing this type of diet. This particular analysis attempts to highlight the scope of impact due to a high-carb diet. As a result, the high-carb diet portion must be isolated to conduct its impact analysis on cardiac conditions.

Unfortunately, his blood lipid test must be completed in a hospital, clinic center, or laboratory on a quarterly basis. If he could measure his lipids data on a daily basis, he would then be able to calculate, compare, and explore the hidden relationship between carbs, glucose, and fatty lipids to offer quantitative and precise proof of the linguistic statements made by other medical research scientists using the BCM approach.

3.3 Graphic diagrams of results

Figure 1 depicts the key information of these two groups and the direct comparison of two PPG waveforms between the total average group and the high-carbs group. The big gap between these two PPG curves is evident. The high-carb PPG curve's tail end during the 120-minute to 180-minute cannot be pushed down by his 4,881 post-meal walking steps due to his excessive-high amount of carbs consumption of 70.4 grams. Such a high level of carbs amount would require exceptionally long hours or rigorous type of non-stop exercise in order to burn it off.

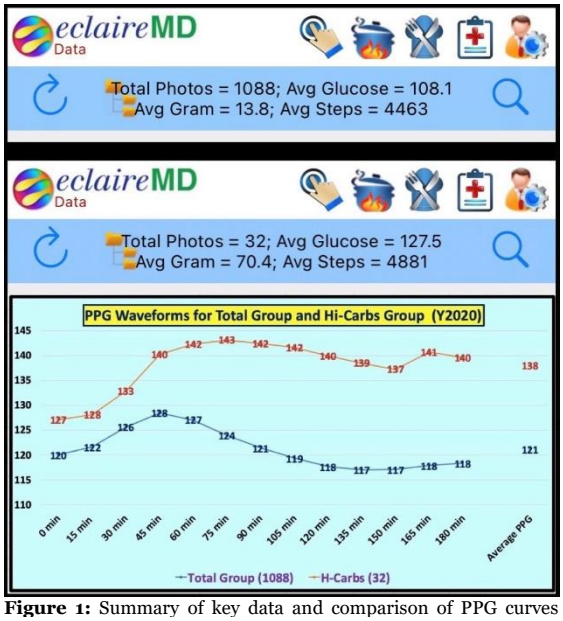
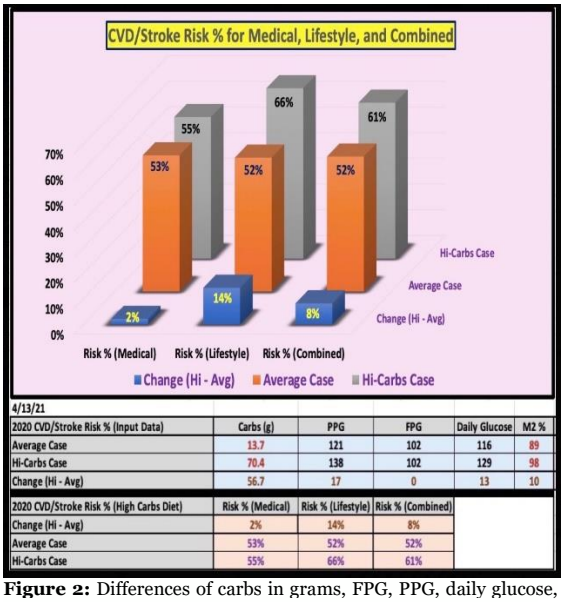


Figure 1: Summary of key data and comparison of PPG curves between the total group and high-carbs group.

Figure 2 reveals the key changed factors in his MI model i.e., carbs in grams, FPG, PPG, daily glucose, and M2 value in a line-chart diagram. The differences between the total average group and the higher-carbs group do not seem significant from diagram 2; however, their impact on the CVD/stroke risk is noticeable in diagram 3.



4/13/21

2020 CVD/Stroke Risk % (Input Data)	Carbs (g)	PPG	FPG	Daily Glucose	M2 %
Average Case	13.7	121	102	116	89
Hi-Carbs Case	70.4	138	102	129	98
Change (Hi - Avg)	56.7	17	0	13	10

2020 CVD/Stroke Risk % (High Carbs Diet)	Risk % (Medical)	Risk % (Lifestyle)	Risk % (Combined)
Change (Hi - Avg)	2%	14%	8%
Average Case	53%	52%	52%
Hi-Carbs Case	55%	66%	61%

Figure 2: Differences of carbs in grams, FPG, PPG, daily glucose, and M2 value between total average group and high-carbs group.

Figure 3 shows the data table of key inputs and the calculated CVD/stroke risk percentage of the medical condition, lifestyle management, along with the combined medical and lifestyle using the MI model. The final results are re-listed in the following table with a format of total group, high-carbs group, and difference:

Risk via medical conditions: 53%, 55%, 2%, risk via lifestyle management: 52%, 66%, 14%, risk via combined medical and lifestyle: 52%, 61%, 8%

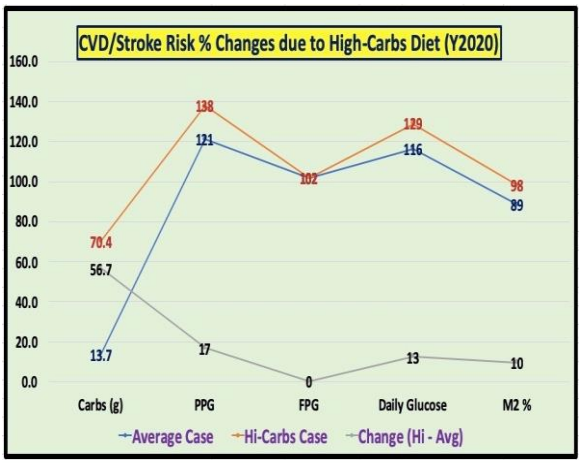


Figure 3: Data table and CVD/stroke risk % difference among medical conditions, lifestyle management, and combined medical and lifestyle.

Using the combined case of risks, the high-carbs group has 61% which is 8% higher than the total average group of 52%.

4. CONCLUSION

With a summary of conclusive outlooks, after he converted his complex mathematical model of CVD/stroke risk assessment into a computer software in 2020, the future tasks of exploring the risk levels of having a CVD/stroke when certain input situations change, such as carbs/sugar intake amounts, will become easier for a patient with chronic diseases to use. This rehearsal of the "what-if" scenario among the three key areas that include lifestyle details, existing medical condition changes, and probability or severity of future disease complication is exceedingly beneficial for patients in controlling their risk of having a complication before it occurs.

Over the past 11 years, he has continuously investigated, studied, and analyzed the collection of ~2 million data regarding his health status, medical conditions, and lifestyle details. He applies his physics knowledge, engineering models, mathematical tools, and computer programming to conduct his medical research. His entire medical research work is based on the aim of achieving high precision with quantitative proof in biomedical findings.

His personal goal is to save his own life through research and then help his family members along with the other patients by distributing his learned knowledge and experiences gained from his 11-years of medical research work to combat these chronic diseases and complications at the root cause level.

5. REFERENCES

1) Hsu GC. Biomedical research using GH-Method: Math-Physical Medicine (Version 3). eclaireMD Foundation, USA. No. 386.

2) Hsu GC. From biochemical medicine to math-physical medicine in controlling type 2 diabetes and its complications. eclaireMD Foundation, USA. No. 387.

3) Hsu GC. Methodology of medical research: Using big data analytics, optical physics, artificial intelligence, signal processing, wave theory, energy theory and transforming certain key biomarkers from time domain to frequency domain with spatial analysis to investigate organ impact by relative energy associated with various medical conditions. eclaireMD Foundation, USA. No. 397.

4) Suh S and Kim JH. Glycemic Variability: How Do We Measure It and Why Is It Important? Diabetes Metab J. 39(4);273–282:2015.

5) Czerwoniuk D, Fendler W, Walenciak and Mlynarski W. GlyCulator: a glycemic variability calculation tool for continuous glucose monitoring data. J Diabetes Sci Technol. 5(2);447–51:2011.

6) Kohnert K-D, Augstein P, Zander E, Heinke P, Peterson K, et al. Glycemic variability correlates strongly with postprandial β-cell dysfunction in a segment of type 2 diabetic patients using oral hypoglycemic agents. Diabetes Care. 32;1058–1062:2009.

7) Hsu GC. Self-recovery of pancreatic beta cell's insulin secretion based on 10+ years annualized data of food, exercise, weight, and glucose using GH-Method: Math-Physical Medicine. eclaireMD Foundation, USA. No. 339.

8) Hsu GC. Self-recovery of pancreatic beta cell's insulin secretion based on annualized fasting plasma glucose, baseline postprandial plasma glucose, and baseline daily glucose data using GH-Method: Math-Physical Medicine. eclaireMD Foundation, USA. No. 297.

9) Hsu GC. Relationship between metabolism and risk of cardiovascular disease and stroke, risk of chronic kidney disease, and probability of pancreatic beta cells self-recovery using GH-Method: Math-Physical Medicine. eclaireMD Foundation, USA. No. 259.

10) Hsu GC. Guesstimate probable partial self-recovery of pancreatic

beta cells using calculations of annualized glucose data using GH-Method: Math-Physical Medicine. eclaireMD Foundation, USA. No. 139.

11) Hsu GC. Probable partial self-recovery of pancreatic beta cells using calculations of annualized fasting plasma glucose (GH-Method: Math-Physical Medicine). eclaireMD Foundation, USA. No. 138.

12) Hsu GC. Probable partial recovery of pancreatic beta cells insulin regeneration using annualized fasting plasma glucose (GH-Method: Math-Physical Medicine). eclaireMD Foundation, USA. No. 133.

13) Hsu GC. Changes in relative health state of pancreas beta cells over eleven years using GH-Method: Math-Physical Medicine. eclaireMD Foundation, USA. No. 112.

14) Hsu GC. Application of estimated energy associated with daily glucose fluctuations on risk assessment of diabetes complications, especially the risk probability of having a cardiovascular diseases or stroke using GH-Method: Math-Physical Medicine. eclaireMD Foundation, USA. No. 431.

15) Hsu GC. Comparison of CVD/Stroke risk percentages between Pre-virus period and Virus period of both without GF factor Case versus with GF factor case using three different energy estimation methods, based on GH-Method: Math-Physical Medicine. eclaireMD Foundation, USA. No. 432.

16) Darjoko ST, Wahyuningsih T and Sudikno S. High carbohydrate intake increases risk of coronary heart disease in adults: a prospective cohort study. Universa Medicina. 38(2);90–99:2019.

17) Saputri FB, Dyah F and Hindariati E. Prevalence proportion of patient with coronary heart disease in inpatient room of RSUD Dr. Soetomo Surabaya in 2017. Biomolecular and Health Science Journal. 3(2);92–95:2020.

Special Issue | Issue No. 2

The GH-Method

Advances In Biomedical Research Using GH-Method: Math-Physical Medicine

Gerald C. Hsu

https://www.theghmethod.com

2021