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The GH-Method

# Viscoelastic or Viscoplastic Glucose Theory (VGT #163): Risk of Developing Cardiovascular Diseases or Strokes via Body Mass Index and Waist-to-Hip Ratio for a Type 2 Diabetes Patient Over 11 Years from 1/1/2012 to 10/30/2022 Using GH-Method: Math-Physical Medicine (No. 757)

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**Abstract**

To reduce the risk of having heart disease and strokes (CVD Risk), a person's body mass index (BMI) should be < 25. Regarding another biomarker, the waist-to-hip ratio (WHR), it should be < 0.9 for males and < 0.8 for females. WHR is defined as the waist length divided by the hip length. During the past 11 years, the author has reduced his annualized CVD Risk from 86% to 52% by improving his BMI from 28.7 to 25.7 and his WHR from 1.12 to 0.87 (WHR < 0.9 is his target). Furthermore, from energy analysis results, it seems that the influence of WHR on his CVD Risk is slightly higher than the influence of BMI on his CVD risk.

**Keywords:** Viscoelastic; Viscoplastic; Cardiovascular diseases; Body mass index; Fat mass index

**Abbreviations:** BMI: body mass index; FMI: fat mass index; CVD: cardiovascular diseases; WHR: waist-to-hip ratio; TD: time-domain; SD: space-domain; FD: frequency-domain

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## 1. INTRODUCTION

The author recently read an article presented at EASD 2022 (European Association for the Study of Diabetes): Stockholm, Sweden on September 20, 2022. "Waist-To-Hip Ratio Is Strongest and Most Consistent Adiposity-Related Predictor of Mortality Outcomes - Interventions should focus on adiposity distribution, not mass."

The following ~600 words of the EASD presentation material are included in this article for the author's future convenience and easiness when searching for this particular information.

"Waist-to-hip ratio is a better predictor of mortality than either body mass index (BMI) or fat mass index (FMI), especially in men, according to an observational analysis and mendelian randomization study. Previous research has demonstrated that "those with a BMI between 22.5 and 24.5 kg/m2 tended to have the lowest risk of all-cause mortality," said lead author Irfan Khan, a medical student at University College Cork in Ireland, during his presentation of the data. "The World Health Organization … used data like these to produce the 'normal' BMI recommendation in the 1990s of 18.5 to 24.5 kg/m2. But we know that BMI is very limited as a measure [of all-cause mortality]. … BMI and all-cause mortality share a 'J' shaped relationship. … The 'normal' BMI range really does vary with secular trends as well as ethnicity and population, and BMI cannot differentiate fat mass from lean mass and subcutaneous fat from visceral fat."

An optimal biomarker, he continued, would have a strong and causal association with mortality, would be consistent across body composition, and would be relatively easy to measure. The investigators used genome-wide association studies (GWAS) and observational analyses to evaluate three biomarkers: BMI, FMI, and waist-to-hip ratio.

"FMI is in the same units as BMI, kg/m2," said Khan. "It is derived from biometrical impedance in kilograms, divided by height squared. … There were not any [GWAS] consortia data available for FMI at the time [of our analysis], so instead we generated a GWAS for FMI using [data on 337,078 individuals from] the British Caucasian UK Biobank Discovery cohort." They next used Mendelian randomization to assess causality with mortality outcomes of BMI, FMI, and waist-to-hip ratio among 50,594 participants in the British Caucasian UK Biobank Validation cohort. Total incident deaths were matched 1:1 with controls. Finally, they compared results of Mendelian randomization analyses with epidemiologic analyses conducted in the Discovery cohort combined with the Validation cohort (n = 387,672).

The primary outcome of the study was all-cause mortality. Secondary outcomes were cause-specific mortality related to cancer, cardiovascular disease (CVD), respiratory disease, and other causes.

The observational, or non-genetic, analyses revealed a "J" shaped association between BMI and FMI and all-cause mortality. On the other hand, the relationship between the waist-to-hip ratio and all-cause mortality was linear. The hazard ratio for all-cause mortality per standard deviation change was greatest with waist-hip-ratio (1.41, 95% confidence interval 1.38–1.43), compared with either BMI (1.14, 95% confidence interval 1.13–1.16) or FMI (1.17, 95% confidence interval 1.16–1.19).

These findings were confirmed by Mendelian randomization. While all three measures were found to be causally linked with all-cause mortality, it was strongest for the waist-to-hip ratio. In addition, the waist-to-hip ratio had the most consistent relationship with all-cause mortality. For both BMI and FMI, the relationship between these measures and all-cause mortality differed by quantile. This was not the case with the waist-to-hip ratio.

Concerning cause-specific mortality, the waist-to-hip ratio was strongly associated with death from CVD and other causes, based on both Mendelian randomization and observational analyses.

Looking at the outcomes by sex revealed that the waist-to-hip ratio was the strongest predictor of all-cause mortality in males but not in females.

 

"Interventions that decrease waist-to-hip ratio are expected to decrease mortality," concluded Khan. "The effect [should be] most dramatic in males, regardless of body composition. Simple recommendations can now be made. Only aim for a lower waist-to-hip ratio, as opposed to BMI categories, as increased abdominal adiposity is still harmful even when the BMI is low. The focus should be now on adiposity distribution rather than adiposity mass."

The above excerpt provides a good explanation of WHR and BMI. The author has analyzed this same subject using his developed math-physical medicine methodology, especially the viscoelastic & viscoplastic glucose theory (VGT), instead of using the above-mentioned statistical tools. His purpose is to re-confirm the fact that whether WHR has a higher degree of influence (may even be more accurate or not?) on CVD Risk than BMI.

He has used his collected body weight data in the early morning during the past 11 years to calculate his BMI (his height remains more or less at a constant level) and WHR (his hip length remains more or less at a constant level). In these calculations, his body weight and waistline length are continuously dropping in a "nonlinear" manner from year to year which finally reached an "almost-constant" level around 2017. These phenomena can be confirmed via his space-domain time-zone analysis results. The phenomenon of 95% energy happened in the earlier period of Y2012-Y2016 while only 5% energy occurred in the recent period of Y2017-Y2022. They have proven that most of the influences (or damages) on his CVD risk changes have already been done during the earlier period of Y2012-Y2016. After that period, his BMI, WHR, and CVD risk have been stabilized at an almost constant level throughout the recent period of Y2017-Y2022.

His risk probability of developing various cardiovascular diseases and strokes (CVD Risk) is calculated using his developed metabolism index mathematical model (MI) in 2014. In this MI model, body weight and waistline are the only two specific elements among its ~500 selected metabolism elements within its 4 categories of chronic diseases and 6 categories of lifestyle details.

Using simple statistics of correlation coefficient on his annual data, the correlation coefficient between CVD and BMI is 93% and the correlation coefficient between CVD and WHR is 94% (the WHR's R is slightly higher than the BMI's R).

Applying the time-domain (TD) energy analysis model, both the square of averaged input amplitude and the summation of input amplitude have provided an almost identical energy ratio of 51% to 49% between BMI and WHR, with a slightly lesser degree of influence (-2%) on CVD from WHR. The author is not surprised by this finding because the TD energy is based on a rudimentary physics definition.

On the other hand, the space-domain (SD-VGT) energy ratios are BMI = 48%; WHR = 52%. The frequency-domain (FD-FFT) energy ratios are BMI = 46%; WHR = 54%. Both of these 2 energy models, SD and FD, have revealed the fact that WHR has a slightly higher influence (4% - 8%) on CVD than BMI on CVD.

It should be noted here that two normalization factors are used in this study: 25 for BMI and 0.9 for WHR. From other medical papers, the clinical ranges of WHR are: "For males, WHR < 0.9 means low CVD risk; WHR within 0.9-0.99 means medium CVD risk, WHR > 1.0 means high CVD risk. For females, WHR < 0.8 means low CVD risk; WHR within 0.8-0.89 means medium CVD risk, WHR > 0.9 means high CVD risk."

The author has demonstrated that math-physical medicine research methodologies, especially SD-VGT, can be applied to almost any or at least most of the available biomedical issues or problems as long as the biomedical variables are time-dependent (organic and dynamic of body cells) and numerical-based (not just linguistic description of the researcher's guess).

Although this particular article is conducted using the collected big data of his personal health, he has already transformed the research process into a mathematical algorithm and a computer software program for other people's use. In the case of using data from thousands or millions of other patients, each patient's data can run through the same computer program and then assemble their outputs. It will then be followed by using a summarized subroutine to conduct further analysis for assembled conclusions.

The author was diagnosed with type 2 (T2D) diabetes in 1995. Since then, he has realized that the root cause of his diabetes and its many medical complications are a direct result of his poor lifestyle beginning in early 1980. As a matter of fact, almost all or most chronic diseases started from obesity or being overweight. In 2010, his body weight was 198 pounds with a 44 inches waistline which was the starting point of his terrible health journey and his serious mortality threat. However, both weight reduction and waistline shrinkage are extremely difficult tasks.

In 2010, he initiated his study and research on endocrinology with a special interest in diabetes. He made a vow to himself that within 10 years, he would learn enough and well understand his personal health situation and the related medical issues using his ready-learned academic knowledge from 7 different universities in 17 years, including mathematics, physics, engineering, computer science, economics and business management, despite his lack of formal training in biology and chemistry. During the past 13 years, he has spent over 40,000 hours on learning and research and read more than 4,000 published medical papers. He has researched four of his chronic diseases and their induced medical complications, including obesity, T2D, hyperlipidemia, hypertension, CVD, CKD, diabetic neuropathy, foot ulcer, bladder infection, diabetic retinopathy, hypothyroidism, diabetic constipation, and diabetic skin fungal infection. He has suffered all of the above-mentioned 13 complications. Luckily, thus far, he has had no sign of either cancer or dementia but these two groups of diseases are his primary concern and major interest in terms of disease understanding and prevention.

After a decade of self-study and research on internal medicine, he has finally realized that the biomedical system is the most sophisticated and complicated system he has ever dealt with. The author has dealt with quite a few sophisticated systems before, such as naval battleships, space shuttles, nuclear power plants, portable computers, solid meddling CAD, smart printers, computer graphics design, semiconductor chips AI design tools. However, the human body is actually an “inner space or inner universe” with many interrelated and mutually-influenced organs inside. Studying internal medicine is like exploring a “black box” that has so many dynamically changing and interrelated organs and diseases are hidden inside. This situation is quite similar to the study of “outer space or outer universe” which includes many mutually-influenced planets using the theory of relativity. The human body has a total of 37.2 trillion live cells which are “organic” and change constantly. This is vastly different from the “inorganic” materials that the author studied at universities for 17 years and practiced as a professional engineer for 30 years. These living cells go through many different lifecycles and developmental stages, such as birth, growth, sickness, damage, healing, splitting, mutation, rebirth, and death. They are very different from those “inorganic” engineering materials, such as steel, concrete, rubber, copper, silicon, soil, ice, and ocean water which were utilized in his past working experiences in various systems of aerospace, defense, computers, nuclear power plants, semiconductors chips, electronic devices, mechanical and structural designs.

During his 13 years of continuous self-study of internal medicine with food nutrition and medical research work, he has finally understood and also identified a major highway of his medical research direction and its moving path. This main highway starts from lifestyle through metabolism and immunity, then through various metabolic-induced diseases, and finally reaches death (mortality) or longevity. This transportation route has guided him to expand his interests and research efforts from diabetes to many other related medical branches, such as cardiology, nephrology, neuroscience, dementia, and cancers. For example, numerous published medical articles have clearly indicated the main path of preventing from developing into the 4 most common chronic diseases, i.e. obesity, diabetes, hypertension, hyperlipidemia, and many various metabolic-induced complications, even including both dementia and cancers, is based upon “the fundamental work on lifestyle management”.

Through research, the author has learned that approximately 65% to 75% of death cases are either directly or indirectly related to metabolic disorders which are linked to poor lifestyle in most cases. In other words, most of those death-causing diseases (mortality) have a common root cause, which is lifestyle management. Unfortunately, many patients still seek a "quick fix" or a "miracle" from their clinical doctors. In fact, there is no "quick fix" or "permanent repair" for many damaged internal organs, which appear as endocrinological diseases. The author believes that lifestyle management combined with strong willpower and persistence in implementation is the only way to deal with the root cause of many diseases, including dementia and cancers, at the most fundamental level.

## 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 his published 700+ papers.

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

### 2.2 The author's diabetes history

The author was a severe T2D patient since 1995. He weighed 220 lb. (100 kg) at that time. By 2010, he still weighed 198 lb. with an average daily glucose of 250 mg/dL (HbA1C at 10%). During that year, his triglycerides reached 1161 (high risk for CVD and stroke) and his albumin-creatinine ratio (ACR) at 116 (high risk for chronic kidney disease). 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. He spent the entire year of 2014 developing a metabolism index (MI) mathematical model. During 2015 and 2016, he developed four mathematical prediction models related to diabetes conditions: weight, PPG, fasting plasma glucose (FPG), and HbA1C (A1C). Through using his developed mathematical metabolism index (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.

In 2017, he 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, and 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 COVID-19 self-quarantined life on 1/19/2020. By 10/16/2022, his weight was further reduced to ~164 lbs. (BMI 24.22) and his A1C was at 6.0% without any medication intervention or insulin injection. In fact, with the special COVID-19 quarantine lifestyle since early 2020, not only has he written and published ~500 new research articles in various medical and engineering journals, but he has also achieved his best health conditions for the past 27 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.

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 extracted the 5-minute intervals from every 15-minute interval for a total of 96 glucose data each day stored in his computer software.

Through the author's medical research work of over 40,000 hours and reading over 4,000 published medical papers online in the past 13 years, he discovered and became convinced that good life habits of not smoking, moderate or no alcohol intake, avoiding illicit drugs; along with eating the right food with well-balanced nutrition, persistent exercise, having a sufficient and good quality of sleep, reducing all kinds of unnecessary stress, maintaining a regular daily life routine contribute to the risk reduction of having many diseases, including CVD, stroke, kidney problems, micro blood vessels issues, peripheral nervous system problems, and even cancers and dementia. In addition, a long-term healthy lifestyle can even "repair" some damaged internal organs, with different required time-length depending on the particular organ's cell lifespan. For example, he has "self-repaired" about 35% of his damaged pancreatic beta cells during the past 10 years.

**Note:** For a more detailed description, please refer to the "consolidated method" section which is given at the beginning of the special issue.

## 3. RESULTS

Figure 1 shows his CVD Risk, BMI, and WHR in the time domain and his VGT software input panel.

Figure 2 depicts his TD and SD analysis results of CVD Risk versus BMI and WHR from Y2012 to Y2022.

Figure 3 displays his VGT analysis data table and the energy ratio comparison using 4 different energy models.

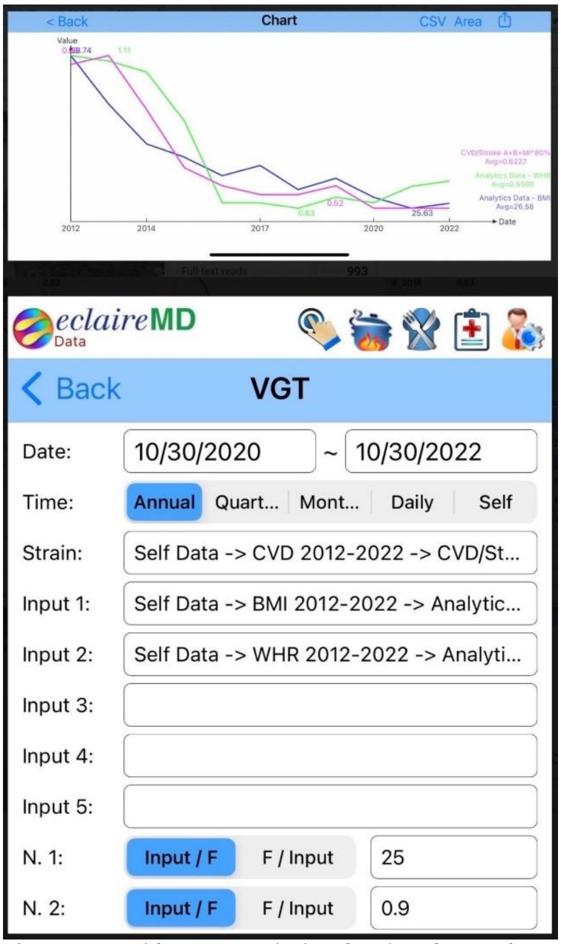


**Figure 1:** CVD risk, BMI, WHR in time-domain and VGT software input panel.

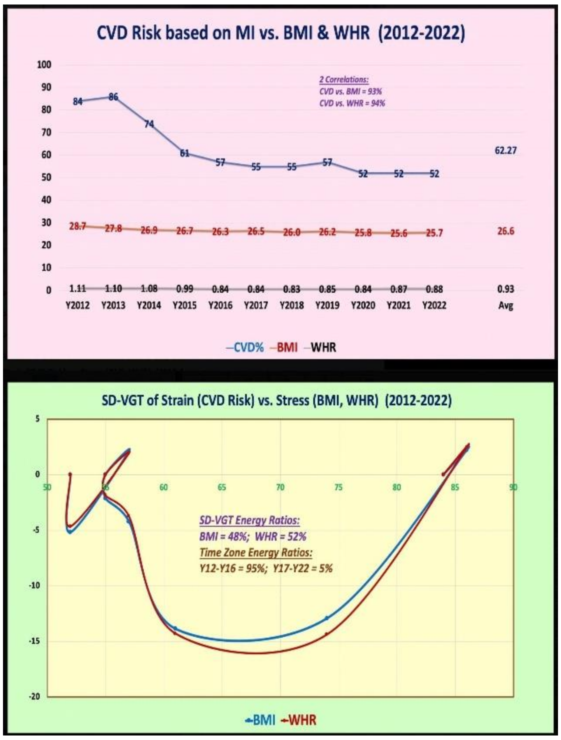


**Figure 2:** TD and SD analysis results of CVD risk versus BMI and WHR from Y2012 to Y2022.

| 5/30/22 | N0.757 | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Correlation | 100% | 93% | 94% | / 25 | / 0.9 | Strain Rate | Strain | Stress 1 | Stress 2 | Height 1 | Height 2 | Area 1 | Area 2 | FD 1 | FD 2 | |
| | CVD% | BMI | WHR | N. 1 | N. 2 | CVD Rate | CVD % | BMI | WHR | BMI | WHR | BMI | WHR | BMI | WHR | Time-Zone |
| Y2012 | 84 | 28.7 | 1.11 | 1.15 | 1.23 | 0 | 84 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | Y2012-Y2016 |
| Y2013 | 86 | 27.8 | 1.10 | 1.11 | 1.22 | 2 | 86 | 2.22 | 2.44 | 1.11 | 1.22 | 2.22 | 2.44 | 191 | 210 | 574 |
| Y2014 | 74 | 26.9 | 1.08 | 1.08 | 1.2 | -12 | 74 | -12.93 | -14.4 | -5.36 | -5.98 | 64.27 | 71.73 | -957 | -1066 | 95% |
| Y2015 | 61 | 26.7 | 0.99 | 1.07 | 1.1 | -13 | 61 | -13.87 | -14.3 | -13.4 | -14.35 | 174.2 | 186.55 | -846 | -872 | |
| Y2016 | 57 | 26.3 | 0.84 | 1.05 | 0.93 | -4 | 57 | -4.21 | -3.73 | -9.04 | -9.02 | 36.15 | 36.07 | -240 | -213 | |
| Y2017 | 55 | 26.5 | 0.84 | 1.06 | 0.93 | -2 | 55 | -2.12 | -1.87 | -3.16 | -2.8 | 6.33 | 5.6 | -117 | -103 | Y2017-Y2022 |
| Y2018 | 55 | 26.0 | 0.83 | 1.04 | 0.92 | 0 | 55 | 0 | 0 | -1.06 | -0.93 | 0 | 0 | 0 | 0 | 31 |
| Y2019 | 57 | 26.2 | 0.85 | 1.05 | 0.94 | 2 | 57 | 2.1 | 1.89 | 1.05 | 0.94 | 2.1 | 1.89 | 120 | 108 | 5% |
| Y2020 | 52 | 25.8 | 0.84 | 1.03 | 0.93 | -5 | 52 | -5.17 | -4.67 | -1.53 | -1.39 | 7.67 | 6.94 | -269 | -243 | |
| Y2021 | 52 | 25.6 | 0.87 | 1.03 | 0.97 | 0 | 52 | 0 | 0 | -2.58 | -2.33 | 0 | 0 | 0 | 0 | |
| Y2022 | 52 | 25.7 | 0.88 | 1.03 | 0.98 | 0 | 52 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 604 |
| Avg | 62 | 26.6 | 0.93 | 1.06 | 1.03 | -2.9 | 62.27 | -3.09 | -3.15 | -3.09 | -3.15 | 293 | 311 | 1560113 | 1799480 | |
| | | | TD1-E: | 1.1236 | 1.0609 | | TD2-E: | 11.70 | 11.35 | | SD-E: | 293 | 311 | 46% | 54% | FD-E: |
| | | | 2.1845 | 51% | 49% | | 23.05 | 51% | 49% | | 604 | 48% | 52% | | | 3359593 |

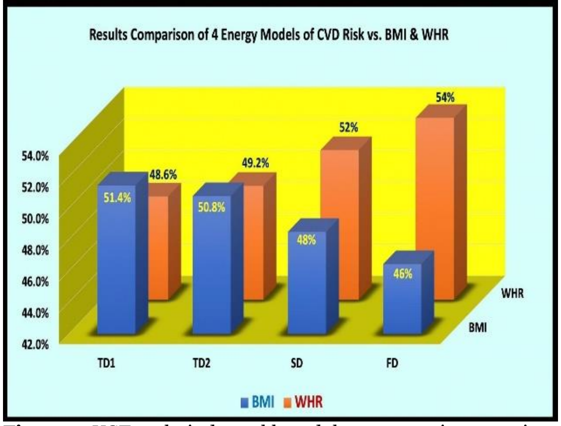


**Figure 3:** VGT analysis data table and the energy ratio comparison using 4 energy models.

# 4. CONCLUSION

There are 4 key findings from this analysis:

(1) Using simple statistics of correlation coefficient on his annual data, the correlation between CVD and BMI is 93% and the correlation between CVD and WHR is 94%.

(2) Applying 2 time-domain energy analysis models, both the square of averaged amplitudes and the summation of amplitudes have provided an almost identical energy ratio of 51% to 49% between BMI and WHR with a slightly lesser degree of influence (-2%) on CVD from WHR. The author is not surprised by this finding because the time-domain energy is based on a rudimentary physics definition.

(3) On the other hand, the space-domain (SD-VGT) energy ratios are BMI = 48%; WHR = 52%. The frequency-domain (FD-FFT) energy ratios are BMI = 46%; WHR = 54%. Both of these 2 energy models have revealed the fact that WHR has a higher influence on CVD (+4% to +8%) than BMI on CVD.

(4) The space-domain time-zone analysis results of 95% energy happened in the earlier period of Y2012-Y2016 while only 5% energy occurred in the recent period of Y2017-Y2022 have proven that most of the influences on his CVD risk changes have already been done during the earlier period of Y2012-Y2016. After that period, his BMI, WHR, and CVD risk have been stabilized throughout the recent period of Y2017-Y2022. The author's note: This space-domain time zone analysis is actually a three-dimensional space that combines time scale, stress scale, and strain scale.

# 5. REFERENCES

For editing purposes, the majority of the references in this paper, which are self-references, have been removed. Only references from other authors' published sources remain. The bibliography of the author's original self-references can be viewed at www.eclairemd.com.

Readers may use this article as long as the work is properly cited, their use is educational and not for profit, and the author's original work is not altered.

For reading more of the author's published VGT or FD analysis results on medical applications, please locate them through three published special editions from the following three specific journals:

(1) Special Issue. The GH-Method. (https://www.theghmethod.com).

(2) Journal of Applied Material Science & Engineering Research (contact: Catherine).

(3) Advances in Bioengineering and Biomedical Science Research (contact: Sony Hazi).

 

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The GH-Method

# Viscoelastic and Viscoplastic Glucose Theory Application in Medicine

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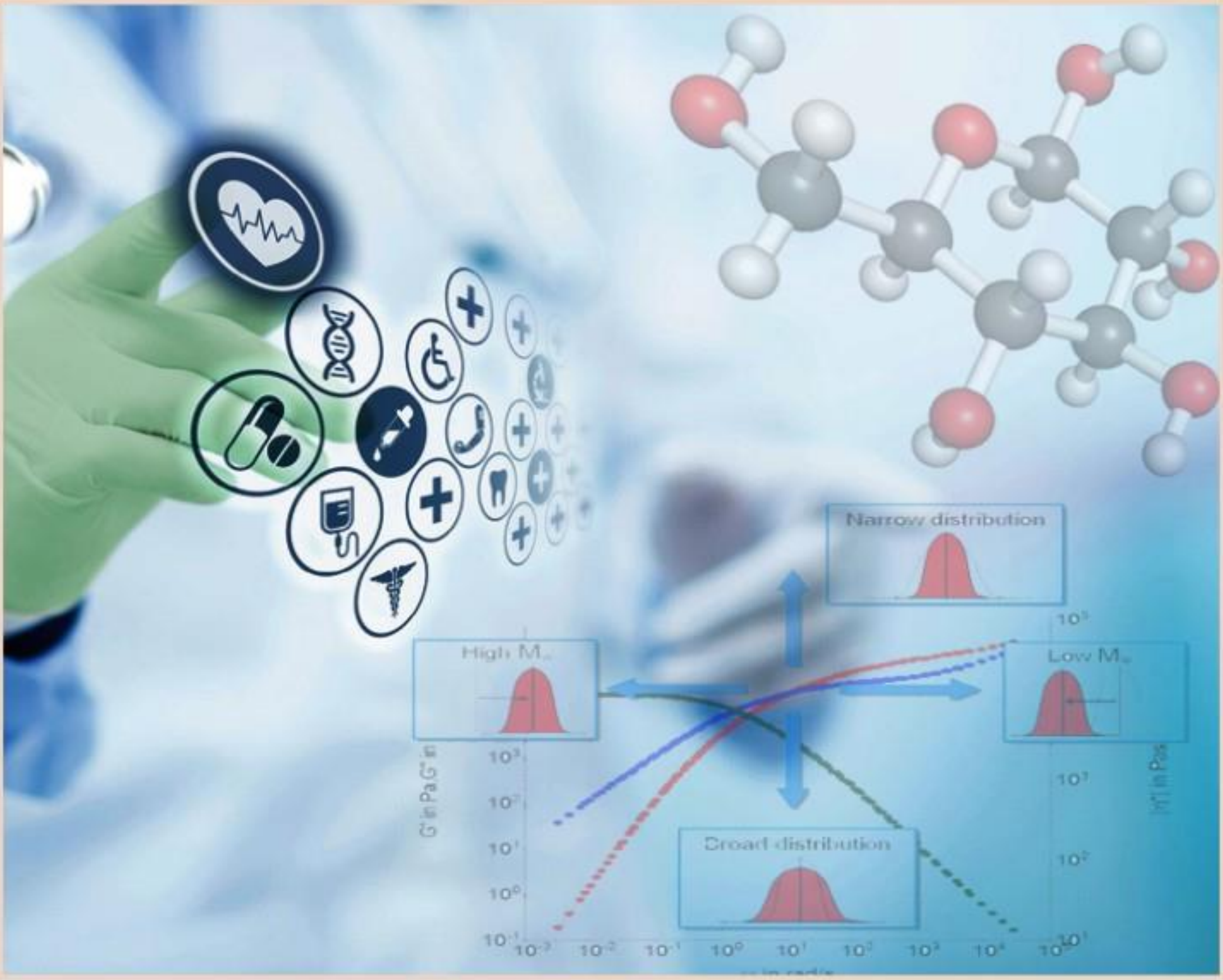


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