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The GH-Method

Viscoelastic Medicine Theory (VMT #338): A Dental Health and Cardiology Study with Three-Tiers Viscoplastic Energy Model Including Obesity, Diabetes, Periodontitis and Cardiovascular Diseases Risks Based on GH-Method: Math-Physical Medicine (No.938)

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Abstract

The author's research in the field of internal medicine has covered a wide range of interconnected areas. Initially, his focus was on fundamental medicine, lifestyles, metabolism, and metabolic disorders from 2010 to 2014. Subsequently, in 2015-2016, he delved into obesity and type 2 diabetes. From 2017 to 2018, his attention shifted to cardiovascular diseases (CVD) and chronic kidney diseases (CKD). Starting in 2019, he explored complications such as dementia and various cancers. However, it wasn't until a recent dental visit in August 2023 that the author began considering the potential link between dental health, specifically tooth and gum conditions like periodontitis, and the aforementioned medical complications. This visit sparked his curiosity about the possible relationship between his tooth and gum conditions and his long history of obesity and type 2 diabetes. Motivated by this newfound interest, he embarked on medical research to investigate the connection between lifestyle factors such as food, exercise, sleep and obesity, diabetes, followed by exploring the relationship between periodontitis and obesity and diabetes, and finally, studying the association between gum diseases (periodontitis) and the risk of CVD. These three-tier analyses utilized the space-domain viscoplastic energy model (SD-VMT) from physics and advanced engineering. In summary, three key findings emerge: 1. The author's periodontitis conditions are influenced by two selected metabolic factors: obesity (51%) and diabetes (49%), both contributing almost equally. However, body weight slightly outweighs diabetes in its influence on the development of periodontitis. 2. The analysis of the author's cardiovascular disease (CVD) risks involves two distinct inputs from gum infections: personal estimated gum energy (48%) and VMT predicted gum energy (52%), indicating nearly equal contributions from these two gum infections data to the risk of developing his CVD conditions. 3. Despite having identical averaged values (achieving 100% prediction accuracy), the waveform correlation between the author's personal estimated gum conditions and the VMT predicted gum conditions is -25%. However, the VMT predicted CVD risk curve still provides valuable information to the author regarding the potential impact of periodontitis conditions on his CVD risk.

Keywords: Viscoelastic; Viscoplastic; Cardiovascular diseases; Obesity; Diabetes; Periodontitis; Diabetes; Exercise

Abbreviations: MI: metabolism index; CVD: cardiovascular diseases; CKD: chronic kidney diseases; T2D: type 2 diabetes; PPG: postprandial plasma glucose; FPG: fasting plasma glucose

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1. INTRODUCTION

The author's research in the field of internal medicine has covered a wide range of interconnected areas. Initially, his focus was on fundamental medicine, lifestyles, metabolism, and metabolic disorders from 2010 to 2014. Subsequently, in 2015-2016, he delved into obesity and type 2 diabetes. From 2017 to 2018, his attention shifted to cardiovascular diseases (CVD) and chronic kidney diseases (CKD). Starting in 2019, he explored complications such as dementia and various cancers. However, it wasn't until a recent dental visit in August 2023 that the author began considering the potential link between dental health, specifically tooth and gum conditions like periodontitis, and the aforementioned medical complications. This visit sparked his curiosity about the possible relationship between his tooth and gum conditions and his long history of obesity and type 2 diabetes. Motivated by this newfound interest, he embarked on medical research to investigate the connection between lifestyle factors such as food, exercise, sleep and obesity, diabetes, followed by exploring the relationship between periodontitis and obesity and diabetes, and finally, studying the association between gum diseases (periodontitis) and the risk of CVD. These three-tier analyses utilized the space-domain viscoplastic energy model (SD-VMT) from physics and advanced engineering.

1.1 Biomedical information

The following sections contain excerpts and concise information drawn from multiple medical articles, which have been meticulously reviewed by the author of this paper. The author has adopted this approach as an alternative to including a conventional reference list at the end of this document, with the intention of optimizing his valuable research time. It is essential to clarify that these sections do not constitute part of the author's original contribution but have been included to aid the author in his future reviews and offer valuable insights to other readers with an interest in these subjects.

Notes from the author of this paper:

Upon reviewing the upcoming excerpts from other published articles, it becomes evident that these findings are predominantly conveyed using qualitative statements. On occasion, these statements include a limited number of numerical values, typically sourced from statistical data within epidemiological studies. However, a recurring deficiency among them is the lack of robust quantitative findings to underpin their qualitative conclusions. Consequently, the author of this paper has deliberately opted to leverage his familiar methodologies from mathematics, physics, and engineering fields in his medical research pursuits. This strategic choice is intended to yield substantial conclusions supported by sound proofs via quantitative data, effectively bridging the current gap in the realm of biomedical research.

Do obesity patients have higher probability to have gum infection?

Obese individuals may have a higher probability of developing gum infections. Obesity is associated with various systemic conditions such as diabetes, cardiovascular disease, and compromised immune function, which can increase the risk of gum infections. Additionally, poor diet and oral hygiene habits commonly seen in obese individuals can also contribute to their gum disease.

Is periodontitis the same as gum infection?

Periodontitis is a form of gum infection. It is a more advanced and severe stage of gum disease that affects the tissues surrounding the teeth, including the gums, ligaments, and bone. Periodontitis occurs when plaque and tartar buildup on the teeth causes inflammation and infections in the gums. If left untreated, periodontitis can lead to tooth loss and damage to the surrounding structures. Regular dental care, including proper oral hygiene practices and professional cleanings, can help prevent and manage periodontitis.

What kind of health issues or diseases can be resulted to periodontitis?

Periodontitis, if left untreated, can lead to various health issues and diseases. Some of the potential consequences of periodontitis include:

1. Tooth loss

As periodontitis progresses, the infection can destroy the supporting tissues and bone around the teeth, leading to tooth loss.

2. Cardiovascular disease

Several studies have suggested a link between periodontitis and an increased risk of heart disease, stroke, and other cardiovascular conditions. The exact mechanism behind this association is still being explored.

3. Diabetes

Periodontitis can make it harder to control blood sugar levels in individuals with diabetes. Conversely, uncontrolled diabetes can also worsen periodontal health.

4. Respiratory infections

The oral bacteria associated with periodontitis can be aspirated into the lungs, potentially leading to respiratory infections such as pneumonia.

5. Rheumatoid arthritis

There is evidence to suggest a connection between periodontitis and an increased risk of developing rheumatoid arthritis or exacerbating its symptoms.

6. Pregnancy complications

Pregnant women with periodontitis may have a higher risk of preterm birth and low birth weight infants.

7. Dementia

Some studies have found a possible link between periodontitis and an increased risk of cognitive decline and dementia in older adults.

It is important to note that while these associations have been observed in studies, the exact nature and extent of the relationship between periodontitis and these conditions are still being investigated. Maintaining good oral hygiene and seeking regular dental care can help prevent and manage periodontitis, reducing the risk of these potential health complications.

Relationship between dental health and overall health of body:

There is a growing body of evidence suggesting a significant relationship between dental health, including periodontitis, or advanced gum disease, and the overall health of the body. Research has already found associations between poor oral health including periodontitis, or advanced gum disease, and several medical conditions or diseases, including cardiovascular disease, diabetes, respiratory infections, adverse pregnancy outcomes, osteoporosis, and rheumatoid arthritis (RA). Periodontitis, or advanced gum disease, has been associated with several internal diseases and conditions. Although a direct causal relationship is still being explored, research suggests that the chronic inflammation and oral bacteria associated with periodontitis may contribute to the development or worsening of certain health systemic conditions. Here are some key connections:

1. Cardiovascular health

Poor oral health, particularly gum disease or periodontitis, has been linked to an increased risk of cardiovascular diseases, such as heart disease and stroke. Inflammation and oral bacteria from gum infections can enter the bloodstream and contribute to the development of atherosclerosis (hardening of the arteries) and blood clot formation.

2. Diabetes

Diabetes and gum disease have a bidirectional relationship. Having diabetes makes individuals more susceptible to gum disease, and gum disease, in turn, can make it more challenging to control blood sugar levels. Gum disease can worsen insulin resistance and lead to higher blood sugar levels, potentially increasing the risk of diabetic complications.

3. Respiratory infections

Poor oral hygiene and gum disease may increase the risk of respiratory infections, such as pneumonia. Oral bacteria can be aspirated into the lungs and cause infections, particularly in vulnerable individuals, such as the elderly or those with compromised immune systems.

4. Adverse pregnancy outcomes

Pregnant women with gum disease have a higher risk of adverse pregnancy outcomes, including preterm birth and low birth weight. The inflammation and infections associated with gum disease can trigger systemic inflammation, potentially affecting the developing fetus and contributing to complications.

5. Osteoporosis

Osteoporosis, a condition characterized by weakened bones, has been associated with oral bone loss and tooth loss. The link between osteoporosis and oral health is thought to be related to the shared common factors like age, hormonal changes, and inflammation.

6. Rheumatoid arthritis (RA)

Some studies have shown a link between periodontitis and an increased risk of developing or worsening rheumatoid arthritis. Chronic inflammation in the gums may promote systemic inflammation, potentially exacerbating the symptoms and progression of RA.

Maintaining good oral hygiene practices, such as regular brushing, flossing, and routine dental check-ups, is essential not only for dental health but also for overall well-being. It is important to recognize the interconnectedness between dental health and overall systemic health, as addressing oral health issues can have a positive impact on overall health and vice versa.

Pathophysiological explanations of relationship between dental heath versus hyperglycemia:

Several pathophysiological mechanisms have been proposed to explain the relationship between dental health (gum and teeth) and hyperglycemia (high blood sugar levels). These mechanisms include:

1. Impaired immune function

Hyperglycemia can impair the function of the immune system, making individuals with diabetes more susceptible to infections, including periodontal disease. The elevated glucose levels in the oral tissues create an environment conducive to bacterial growth and plaque formation, leading to gum inflammation and periodontal disease.

2. Altered collagen metabolism

Chronic hyperglycemia can affect collagen metabolism, a key structural component of gum and tooth tissues. High blood sugar levels can lead to the increased production of advanced glycation end products (AGEs), which can weaken the collagen fibers in the gums and periodontal ligaments. This can result in the loss of attachment between the teeth and gums, leading to gum recession and tooth mobility.

3. Impaired blood flow and tissue oxygenation

Hyperglycemia can cause damage to the blood vessels, leading to reduced blood flow and impaired tissue oxygenation. In the oral cavity, this can result in poor circulation to the gums and teeth, compromising their ability to heal and fight off infections. Reduced blood flow can also impair the delivery of essential nutrients and oxygen to the oral tissues, exacerbating gum and teeth problems.

4. Increased inflammation

Diabetes is associated with systemic inflammation, and this chronic low-grade inflammation can contribute to the development and progression of periodontal disease. Hyperglycemia can up-regulate inflammatory mediators, increasing the inflammatory response in the gums and exacerbating tissue damage. In turn, chronic gum inflammation can further worsen systemic inflammation, creating a bidirectional relationship.

5. Impaired saliva production

High blood sugar levels can affect salivary gland function and reduce saliva production. Saliva plays a crucial role in maintaining oral health by neutralizing acids, washing away food particles, and providing a protective barrier against bacteria. Reduced saliva production can lead to dry mouth, increasing the risk of dental caries, tooth decay, and gum disease.

It is important to manage a diabetes patient's hyperglycemia situation through proper diabetes management, including regular blood sugar monitoring, medication, diet control, exercise, and regular dental care. Maintaining good oral hygiene, such as brushing and flossing regularly and visiting the dentist regularly, is also crucial for preventing and managing gum and teeth problems associated with hyperglycemia.

What is collagen?

Collagen is the most abundant protein in the human body, accounting for approximately 30% of the total protein mass. It is a fibrous protein that provides structure, strength, and elasticity to various tissues, including the skin, bones, tendons, ligaments, and blood vessels.

Collagen is composed of amino acids, primarily glycine, proline, and hydroxyproline, which form a unique triple-helix structure. This structural arrangement gives collagen its characteristic strength and stability.

Collagen plays a vital role in the body's connective tissues. In the skin, it provides hydration, firmness, and elasticity, contributing to a youthful and smooth appearance. In bones, it is a crucial component of the matrix that provides strength and support. In tendons and ligaments, collagen helps to maintain their flexibility and ability to withstand tension and stretching. Collagen is also found in blood vessels, contributing to their strength and integrity.

Additionally, collagen is involved in wound healing and tissue repair processes. It acts as a scaffold for new tissue formation and helps in the recruitment and organization of cells involved in the healing process.

As we age, the production of collagen naturally declines, which can lead to the formation of wrinkles, sagging skin, joint stiffness, and weakened connective tissues. Various factors including genetics, sun exposure, and lifestyle choices can also impact collagen production.

Due to its importance in maintaining healthy tissues, collagen has gained popularity as a dietary supplement and ingredient in skincare products. Collagen supplements are marketed for their potential benefits in improving skin elasticity, joint health, and reducing signs of aging. However, more research is needed to fully understand the effectiveness and specific benefits of collagen supplementation.

Overall, collagen is a crucial protein that contributes to the structural integrity and function of various tissues in the body, including dental structures.

Periodontitis

Periodontitis is a severe gum infection that damages the soft tissues and destroys the bone that supports the teeth. It is usually caused by poor oral hygiene, leading to the build-up of plaque and tartar on the teeth. If left untreated, periodontitis can result in tooth loss. Treatment typically involves professional deep cleaning of the affected areas, medication, and in some cases, surgery. It is important to practice good oral hygiene, including regular brushing, flossing, and routine dental check-ups, to prevent or manage periodontitis.

An interesting article (8/22/2023):

How a simple mouth rinse could help predict your risk of heart disease
By Eileen Bailey on August 22, 2023 — Fact checked by Michelle T. Wyatt, MD

Researchers say a mouth rinse may be effective in determining heart disease risk.

Researchers report that a simple mouth rinse that checks white blood cell levels may be helpful in predicting heart disease.

They say the rinse can detect gum inflammation that can lead to periodontitis, a condition linked to cardiovascular disease.

Experts say you can lower your risk of gum disease by not smoking as well as brushing and flossing your teeth regularly.

A simple oral rinse to check levels of white blood cells might be able to predict the risk of heart disease, according to a study published August 18 in the journal Frontiers of Oral Health.

Gum inflammation can lead to periodontitis, which is linked to heart disease.

The researchers evaluated younger adults without diagnosed periodontal problems to determine if lower levels of oral inflammation can be clinically relevant to cardiovascular health.

Linking gum disease to heart disease risk

In the pilot study, researchers assessed 28 non-smokers between the ages of 18 and 30 without co-morbid conditions or medications that could affect cardiovascular risk.

The researchers used a simple oral rinse to measure the level of white blood cells in the saliva of healthy adults to see if there was a connection to heart disease. The process was as follows:

- Each participant fasted for 6 hours before visiting the lab.
- They then rinsed their mouth with water.
- Then they rinsed with a saline solution.
- The researchers collected saline for analysis.
- The participants laid down for 10 minutes before having an electrocardiogram completed.
- They remained lying down for another 10 minutes.
- Researchers measured blood pressure, flow-mediated dilation, and pulse-wave velocity.

The scientists reported that high white blood cells in saliva had a significant relationship to poor flow-mediated dilation, suggesting an elevated risk of cardiovascular disease.

However, there wasn't a relationship between white blood cells and pulse-wave velocity, indicating long-term impacts on the arteries had not yet occurred.

"This could be because the participants were young and relatively healthy," said Dr. Rigved Tadwalkar, a cardiologist at Providence Saint John's Health Center in Santa Monica, CA, who was not involved in the study.

"I think it would be helpful to see a more varied group of participants in age and health status," he told Medical News Today.

Oral inflammation may leak into the vascular system

Flow-mediated dilation refers to the widening of an artery when blood flow increases.

Pulse-wave velocity measures arterial stiffness and is an independent predictor of cardiovascular risk.

Lifestyle changes, healthy diet, exercise routines, and managing blood pressure and cholesterol can improve pulse-wave velocity.

The researchers hypothesized that inflammation from the mouth could leak into the vascular system and impact the arteries' ability to produce nitric oxide, reducing their ability to respond to changes in blood flow.

Higher levels of white blood cells would cause a higher level of vascular dysfunction.

"This type of screening is a very good idea," Peggy Budhu, DDS, a dentist at the Family Health Centers at NYU Langone in New York, not involved in the study, told MNT.

"It reminds me of the early days of HIV rapid testing in different clinical settings. Dental clinics were offering screening for HIV when it was difficult to get tested."

"The preliminary results are promising, but a larger sample size is necessary. I would like to see more data with a larger sample size, a sample of patients with treated periodontal disease and patients with active disease. I would offer this as a screening test once we have more data and more studies on the correlation between the saliva test and the incidence of cardiovascular disease."
— Peggy Budhu, dentist

What is periodontal disease?

"Periodontal disease is a chronic oral infection," said Constantine Pavlakos, DDS, a diplomate of the American Board of Periodontology.

"This can lead to inflammatory responses resulting in the destruction of the

periodontium and can also mitigate systemic effects. The onset of periodontal inflammation is triggered by microbial colonization in the gingival unit."

"There are numerous studies in the literature that have suggested a correlation between periodontitis and systemic diseases, including cardiovascular disease, diabetes, and preterm low-weight births," Pavlakos told MNT.

The condition is caused by plaque that has hardened to form tartar, which requires professional cleaning by a dentist or dental hygienist.

In its more severe form, the gums pull away from the tooth, according to the Centers for Disease Control and Prevention (CDC) (Trusted Source). When this occurs, bone can be lost, and the teeth may loosen or fall out.

Periodontal disease is more common in males than females, those living below the poverty level, current smokers, and those with less than a high school diploma.

More than 47% of adults 30 and over have some form of the disease.

Warning signs of periodontal disease

According to the CDC, some early warning signs of periodontal disease include:

- bad breath or bad taste that won't go away
- red or swollen gums
- tender or bleeding gums
- painful chewing
- loose teeth
- sensitive teeth
- gums that have pulled away from your teeth
- any change in the way your teeth fit together when you bite
- any change in the fit of partial dentures

According to the National Institutes of Health (NIH) (Trusted Source), you can reduce the risk of developing periodontal disease by:

- brushing your teeth twice a day with a fluoride toothpaste
- flossing regularly to remove plaque from between teeth
- visiting your dentist at least once a year, more often if you have any warning signs
- quitting smoking

Maintaining oral health may help reduce your risk of cardiovascular disease and also improve overall health. In some cases, deep cleaning or surgery can help restore dental health.

However, because this is a progressive disease, it is essential to see your dentist or periodontist on a regular basis.

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 760+ papers.

The first paper, No. 386 describes his MPM methodology in a general conceptual format. The second paper, No. 387 outlines the history of his personalized diabetes research, various application tools, and the differences between biochemical medicine (BCM) approach versus the MPM approach. The third paper, No. 397 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 to develop 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 over 40,000 hours and read 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.

2.3 Energy theory

The human body and organs have around 37 trillion live cells which are composed of different organic cells that require energy infusion from glucose carried by red blood cells; and energy consumption from labor-work or exercise. When the residual energy (resulting from the plastic glucose scenario) is stored inside our bodies, it will cause different degrees of damage or influence to many of our internal organs.

According to physics, energies associated with the glucose waves are proportional to the square of the glucose amplitude. The residual energies from elevated glucoses are circulating inside the body via blood vessels which then impact all of the internal organs to cause different degrees of damage or influence, e.g. diabetic complications. Elevated glucose (hyperglycemia) causes damage to the structural integrity of blood vessels. When it combines with both hypertension (rupture of arteries) and hyperlipidemia (blockage of arteries), CVD or Stroke happens. Similarly, many other deadly diseases could result from these excessive energies which would finally

shorten our lifespan. For an example, the combination of hyperglycemia and hypertension would cause micro-blood vessel's leakage in kidney systems which is one of the major cause of CKD.

The author then applied Fast Fourier Transform (FFT) operations to convert the input wave from a time domain into a frequency domain. The y-axis amplitude values in the frequency domain indicate the proportional energy levels associated with each different frequency component of input occurrence. Both output symptom value (i.e. strain amplitude in the time domain) and output symptom fluctuation rate (i.e. the strain rate and strain frequency) are influencing the energy level (i.e. the Y-amplitude in the frequency domain).

Currently, many people live a sedentary lifestyle and lack sufficient exercise to burn off the energy influx which causes them to become overweight or obese. Being overweight and having obesity leads to a variety of chronic diseases, particularly diabetes. In addition, many types of processed food add unnecessary ingredients and harmful chemicals that are toxic to the bodies, which lead to the development of many other deadly diseases, such as cancers. For example, ~85% of worldwide diabetes patients are overweight, and ~75% of patients with cardiac illnesses or surgeries have diabetes conditions.

In engineering analysis, when the load is applied to the structure, it bends or twists, i.e. deform; however, when the load is removed, it will either be restored to its original shape (i.e, elastic case) or remain in a deformed shape (i.e. plastic case). In a biomedical system, the glucose level will increase after eating carbohydrates or sugar from food; therefore, the carbohydrates and sugar function as the energy supply. After having labor work or exercise, the glucose level will decrease. As a result, the exercise burns off the energy, which is similar to load removal in the engineering case. In the biomedical case, both processes of energy influx and energy dissipation take some time which is not as simple and quick as the structural load removal in the engineering case. Therefore, the age difference and 3 input behaviors are "dynamic" in nature, i.e. time-dependent. This time-dependent nature leads to a "viscoelastic or viscoplastic" situation. For the author's case, it is "viscoplastic" since most of his biomarkers are continuously improved during the past 13-year time window.

2.4 Time-dependent output strain and stress of (viscous input*output rate)

Hooke's law of linear elasticity is expressed as:

Strain (ε: epsilon)
= Stress (σ: sigma) / Young's modulus (E)

For biomedical glucose application, his developed linear elastic glucose theory (LEGT) is expressed as:

PPG (strain)
= carbs/sugar (stress) * GH.p-Modulus (a positive number) + post-meal walking k-steps * GH.w-Modulus (a negative number)

Where GH.p-Modulus is reciprocal of Young's modulus E.

However, in viscoelasticity or viscoplasticity theory, the stress is expressed as:

Stress
= viscosity factor (η: eta) * strain rate (dε/dt)

Where strain is expressed as Greek epsilon or ε.

In this article, in order to construct an "ellipse-like" diagram in a stress-strain space domain (e.g. "hysteresis loop") covering both the positive side and negative side of space, he has modified the definition of strain as follows:

Strain
= (body weight at certain specific time instant)

He also calculates his strain rate using the following formula:

Strain rate
= (body weight at next time instant) - (body weight at present time instant)

The risk probability % of developing into CVD, CKD, Cancer is calculated based on his developed metabolism index model (MI) in 2014. His MI value is calculated using inputs of 4 chronic conditions, i.e. weight, glucose,

blood pressure, and lipids; and 6 lifestyle details, i.e. diet, drinking water, exercise, sleep, stress, and daily routines. These 10 metabolism categories further contain ~500 elements with millions of input data collected and processed since 2010. For individual deadly disease risk probability %, his mathematical model contains certain specific weighting factors for simulating certain risk percentages associated with different deadly diseases, such as metabolic disorder-induced CVD, stroke, kidney failure, cancers, dementia; artery damage in heart and brain, micro-vessel damage in kidney, and immunity-related infectious diseases, such as COVID death.

Some of explored deadly diseases and longevity characteristics using the viscoplastic medicine theory (VMT) include stress relaxation, creep, hysteresis loop, and material stiffness, damping effect based on time-dependent stress and strain which are different from his previous research findings using linear elastic glucose theory (LEGT) and nonlinear plastic glucose theory (NPGT).

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 4 data table of dental and heart.

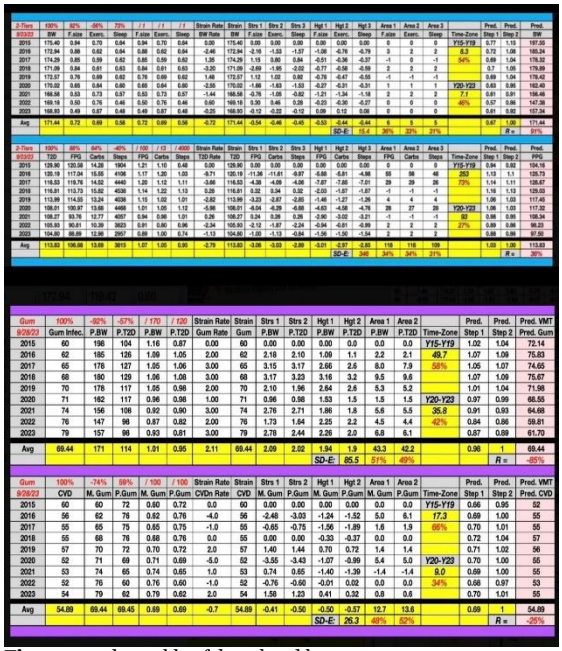

Figure 1: 4 data table of dental and heart.

Figure 2 shows SD-VMT output energy curves of dental and heart.

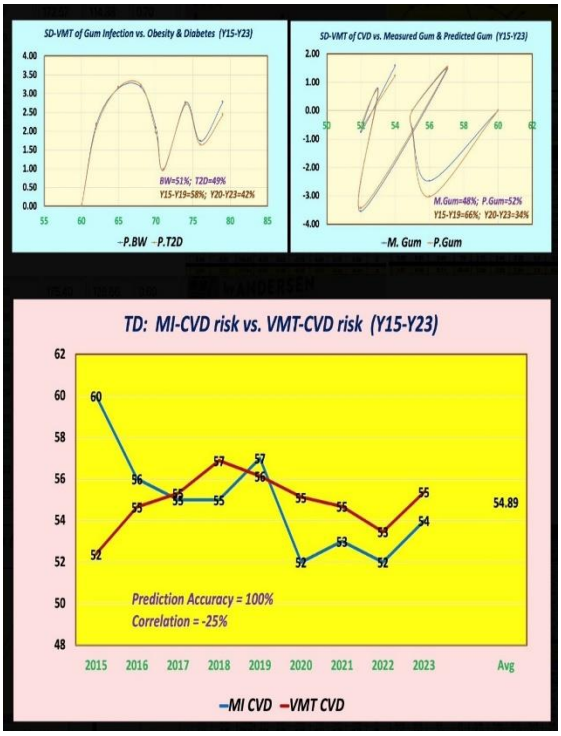

Figure 2: SD-VMT output energy curves of dental and heart.

4. CONCLUSION

In summary, the key findings can be summarized as follows:

The author's overall dental conditions are impacted by four selected factors, each with associated energy ratios: Age (29%), hygiene practices (26%), dentist checkups (25%), and hyperglycemia intensity (20%). These four energy distribution percentages indicate that age plays the most significant role in tooth bone loss, followed by hygiene practices and regular dentist checkups affecting periodontitis. Hyperglycemia intensity due to diabetes has a comparatively lesser impact on the author's dental health, yet it remains an essential factor to monitor closely.

The overarching trend in the author's dental health exhibits a distinct time-bound energy distribution: 10% of damage transpired between 2018 and 2020, whereas a substantial 90% occurred between 2021 and 2023. This suggests that the majority of deterioration in the author's overall dental health took place within the past three years, coinciding with the onset of the COVID-19 pandemic. This outcome likely stems from a combination of three factors: advancing age,

alterations in hygiene practices, and restricted access to routine dentist checkups amid the pandemic. Notably, the author's diabetes-related hyperglycemia situation did not exacerbate during the COVID-19 period.

While the analysis results are coherent and rational, the inclusion of scientific and quantitative analysis further enhances the credibility of the qualitative conclusion.

5. REFERENCES

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

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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Viscoelastic and Viscoplastic Glucose Theory Application in Medicine

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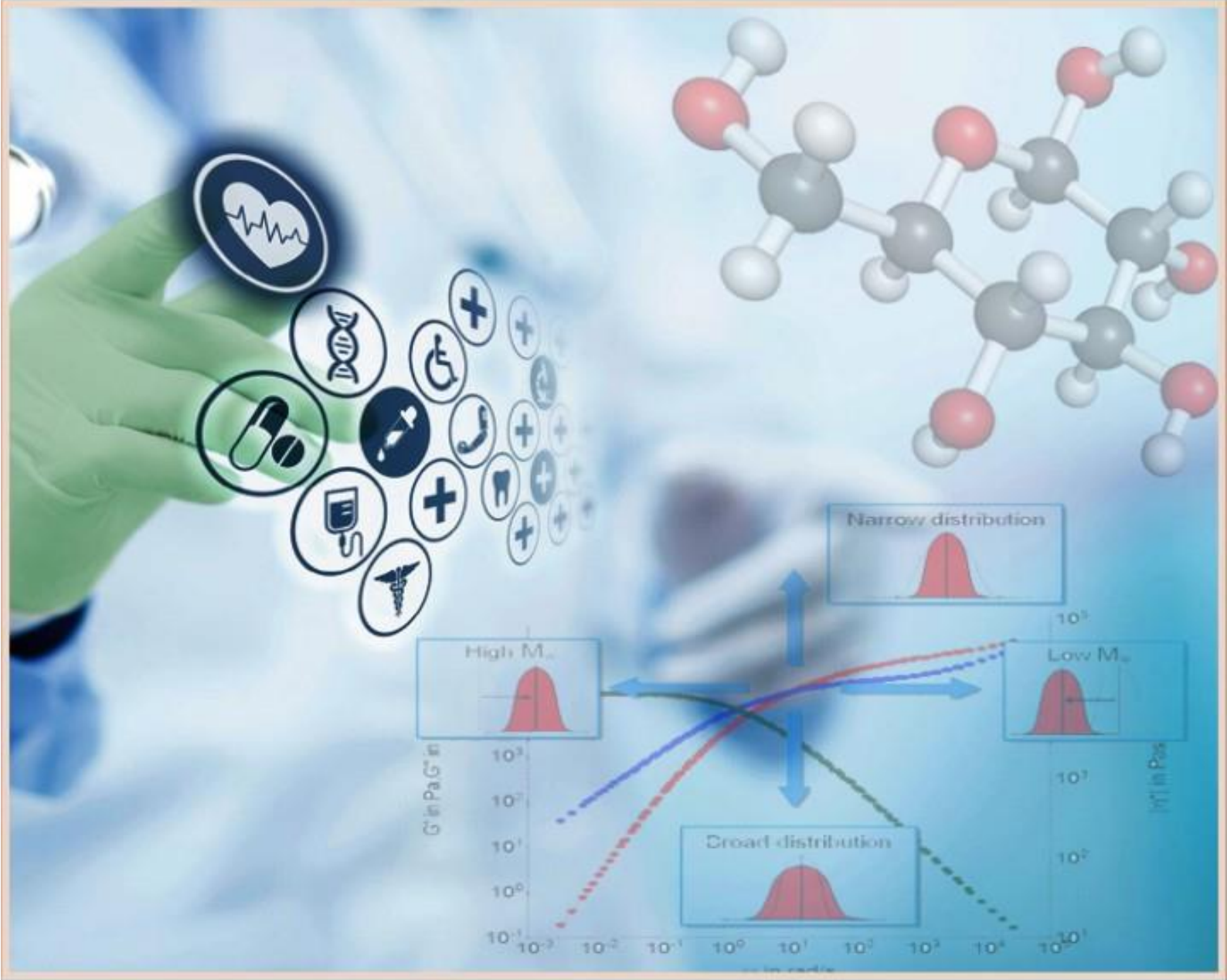

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