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Clinical Evaluation of the Co-relationship Between Food and Salivary Amylase During Conscious Chewing: A Graphical Comparative Study of Glucose Equivalents

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Abstract-- **Background: Type 2 Diabetes Mellitus (T2DM) represents a growing global metabolic crisis. The initial phase of carbohydrate digestion begins in the buccal cavity with salivary amylase (ptyalin). This study investigates the correlation-ship between foodstuff and enzymes during 'conscious chewing' and its impact on the transmutation of complex carbohydrates into bioavailable sugar equivalents.**

Methods: **An experimental clinical study was conducted at the R&D Section of the Research Laboratory, AYUSH University, Kurukshetra, India. Fresh chapati (unchewed and chewed) was assessed for Total Carbohydrate (TC) and Reducing Sugar (RS) equivalent levels using Optical Density (ELISA) at 630 nm and 620 nm across specific time intervals (10s, 30s, and till the feeling of sweetness). The study compared a non-diabetic subject with a T2DM subject (10-year history).**

Results: **In the non-diabetic subject, TC and RS levels peaked at 30 seconds (190.30 and 8.10 mg GE/g, respectively) and decreased upon extended chewing till sweetness. In the T2DM subject, TC peaked early and decreased upon extended chewing, while RS ratios displayed irregular increases.**

Conclusion: **Conscious chewing significantly alters the physicochemical properties of food before it reaches the unconscious digestive tract. T2DM subjects exhibit altered salivary amylase efficacy, likely influenced by high baseline systemic blood glucose. Prolonged conscious chewing may serve as a critical clinical intervention to enhance proper 'human-made' sugar transmutation.**

I. Introduction

Type 2 Diabetes Mellitus (T2DM) accounts for almost 90% of all diabetes cases globally [1]. According to recent World Health Organization (WHO) survey warnings, the prevalence of Diabetes Mellitus is escalating, with projections indicating the patient population will double over the next three decades due to physical, mental, and social factors [2]. T2DM arises primarily from metabolic disorders, insulin resistance, insufficient insulin secretion, or malabsorption of sugar, which is further exacerbated by sedentary and stressful lifestyles [3].

The first physiological phase of the correlation principle of digestion initiates in the mouth cavity—the most vital and conscious area of the gastrointestinal tract [4]. Here, outer food structures (carbohydrates and starches) are transformed into the first endogenous stock of sugar content through the enzymatic action of ptyalin (salivary amylase) [5]. Complex carbohydrates must be assimilated with enzymes and transmuted into a simple sugar form in the mouth cavity. This glucose—often termed 'human-made sugar' or 'indigenous sugar'—is manufactured by human mechanics at a subtle level when the food is processed with heightened sensory awareness of taste and smell [6].

The concept of 'conscious chewing' posits that the physiological act of mastication, when paired with conscious awareness, optimizes the release and assimilation of salivary enzymes [7]. The transmutation area of the navel region (Manipur Chakra in Ayurveda) operates autonomously as an unconscious zone where pancreatic enzymes handle unchewed carbohydrates. Therefore, establishing a co-relationship between the ingested foodstuff and the buccal cavity during the conscious phase is critical [8].

This study hypothesizes that measuring the quantity of sugar in the mouth cavity during conscious chewing at specific intervals (10 seconds, 30 seconds, and continuously until the bolus transforms into a sweetened liquified state) will reveal the optimal correlation-ship between the carbohydrate matrix and salivary ptyalin, contrasting normal physiological responses with those of a T2DM pathophysiology.

II. Materials and Methods

2.1 Study Setting and Design: An experimental, comparative clinical study was conducted in the R&D Section of the Research Laboratory at AYUSH University, Kurukshetra, India.

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2.2 Subjects: The study involved two primary human subjects:

- Subject 1: A healthy, non-diabetic individual (Normal).
- Subject 2: A patient suffering from Type 2 Diabetes Mellitus (T2DM) for the past ten years, with a baseline random blood glucose (RBG) test of 233 mg/dl.

2.3 Test Material: Freshly prepared Chapati (Indian flatbread, a primary source of complex carbohydrates) was used as the test foodstuff.

2.4 Interventions and Time Intervals: Measurements were taken for the unchewed fresh chapati (baseline) and after chewing intervals recorded strictly at:

- 10 seconds
- 30 seconds
- Consciously chewed continuously until the subject reported a distinct 'feeling of sweetness' (Correlation-ship Principle).

2.5 Biochemical Assays:

- Total Carbohydrate (TC) glucose equivalent levels were determined utilizing Optical Density via Enzyme-Linked Immunosorbent Assay (ELISA) at 630 nm.
- Reducing Sugar (RS) glucose equivalent levels were determined utilizing Optical Density (ELISA) at 620 nm. Results were expressed as mg of Glucose Equivalents per gram of chapati (mg GE/g).

III. Results: Clinical Data And Graphical Analysis

The results derived from the Optical Density assays detail the transformation of complex carbohydrates into glucose equivalents. Data was recorded over multiple days to observe the consistency of the correlation-ship principle in both non-diabetic and diabetic subjects. The graphical representations below highlight the key deviations between normal and pathophysiological states.

3.1 Graphical Breakdown of Chewing Phases (Day 1)

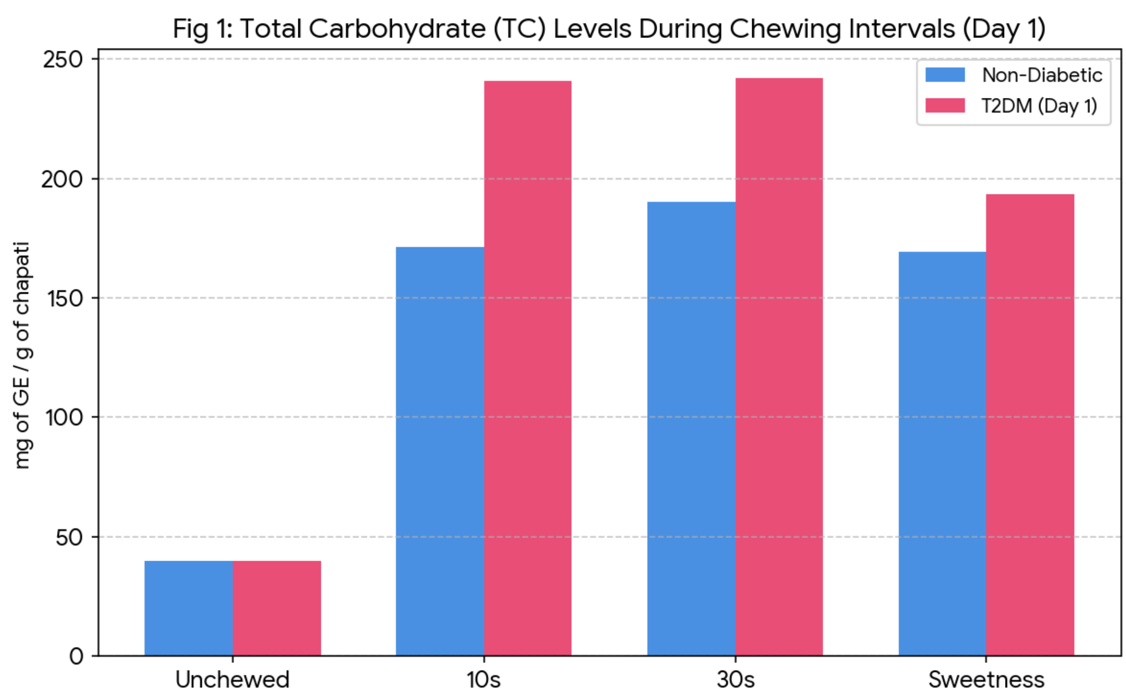

Figure 1 illustrates that while both subjects experience an initial surge in TC during early chewing, the diabetic subject experiences a dramatically higher initial peak, indicating potential differences in initial carbohydrate saturation or amylase buffering.

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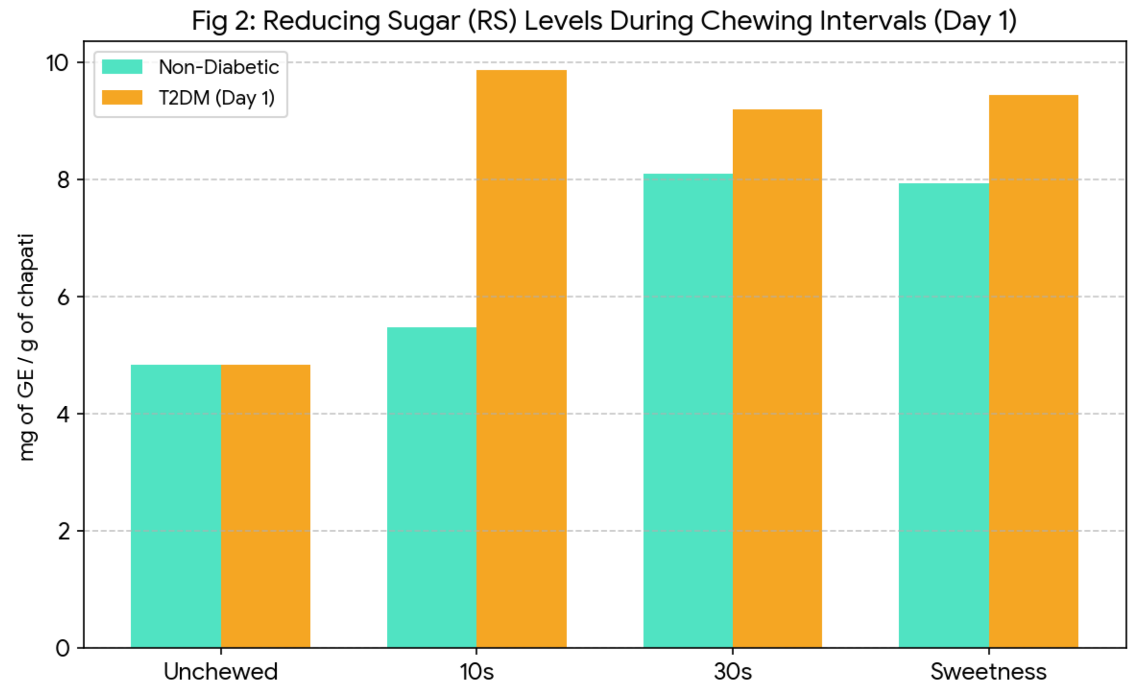

Figure 2 demonstrates the variance in Reducing Sugar generation. The non-diabetic subject shows a steady, controlled curve, whereas the T2DM subject shows early instability.

3.2 Comprehensive Data Tables

Non-Diabetic Profile (Day 1)

Table 1: Total Carbohydrate (TC) glucose equivalent level of Fresh Chapati (OD at 630 nm) - Non-Diabetic

S No.	Sample	Optical Density (630 nm)	mg of GE / g of chapati
1	Unchewed (Fresh Roti)	0.146	39.9
2.1	Chewed (10s)	0.502	171.3
2.2	Chewed (30s)	0.554	190.3
3.1	Consciously Chewed (till feeling of sweetness)	0.496	169.2

Table 2: Reducing Sugar (RS) glucose equivalent level of Fresh Chapati (OD at 620 nm) - Non-Diabetic

S No.	Sample	Optical Density (620 nm)	mg of GE / g of chapati
1	Unchewed (Fresh Roti)	0.040	4.84
2.1	Chewed (10s)	0.048	5.48
2.2	Chewed (30s)	0.079	8.10
3.1	Consciously Chewed (till feeling of sweetness)	0.077	7.94

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Diabetic Profile (T2DM) - Multi-Day Assessment

Table 3: Day 1 - Total Carbohydrate (TC) glucose equivalent level (OD at 630 nm) - Diabetic

S No.	Sample	Optical Density (630 nm)	mg of GE / g of chapati
1	Unchewed (Fresh Roti)	0.146	39.9
2.1	Chewed (10s)	0.693	240.8
2.2	Chewed (30s)	0.696	241.9
3.1	Consciously Chewed (till sweetness)	0.562	193.3

Table 4: Day 1 - Reducing Sugar (RS) glucose equivalent level (OD at 620 nm) - Diabetic

S No.	Sample	Optical Density (620 nm)	mg of GE / g of chapati
1	Unchewed (Fresh Roti)	0.040	4.84
2.1	Chewed (10s)	0.100	9.87
2.2	Chewed (30s)	0.092	9.20
3.1	Consciously Chewed (till sweetness)	0.095	9.45

Table 5: Day 2 - Total Carbohydrate (TC) glucose equivalent level (OD at 630 nm) - Diabetic

S No.	Sample	Optical Density (630 nm)	mg of GE / g of chapati
1	Unchewed (Fresh Roti)	0.155	45.168
2.1	Chewed (10s)	0.664	222.9
2.2	Chewed (30s)	0.598	206.28
3.1	Consciously Chewed (till sweetness)	0.501	171.0

Table 6: Day 2 - Reducing Sugar (RS) glucose equivalent level (OD at 620 nm) - Diabetic

S No.	Sample	Optical Density (620 nm)	mg of GE / g of chapati
1	Unchewed (Fresh Roti)	0.046	5.32
2.1	Chewed (10s)	0.155	14.53
2.2	Chewed (30s)	0.084	8.53
3.1	Consciously Chewed (till sweetness)	0.095	9.45

Table 7: Day 3 - Total Carbohydrate (TC) glucose equivalent level (OD at 630 nm) - Diabetic

S No.	Sample	Optical Density (630 nm)	mg of GE / g of chapati
1	Unchewed (Fresh Roti)	0.131	36.43
2.1	Chewed (10s)	0.734	277.4
2.2	Chewed (30s)	0.607	209.6
3.1	Consciously Chewed (till sweetness)	0.482	164.0

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Table 8: Day 3 - Reducing Sugar (RS) glucose equivalent level (OD at 620 nm) - Diabetic

S No.	Sample	Optical Density (620 nm)	mg of GE / g of chapati
1	Unchewed (Fresh Roti)	0.067	7.09
2.1	Chewed (10s)	0.088	8.86
2.2	Chewed (30s)	0.096	9.54
3.1	Consciously Chewed (till sweetness)	0.077	7.94

3.3 Longitudinal Diabetic Trends

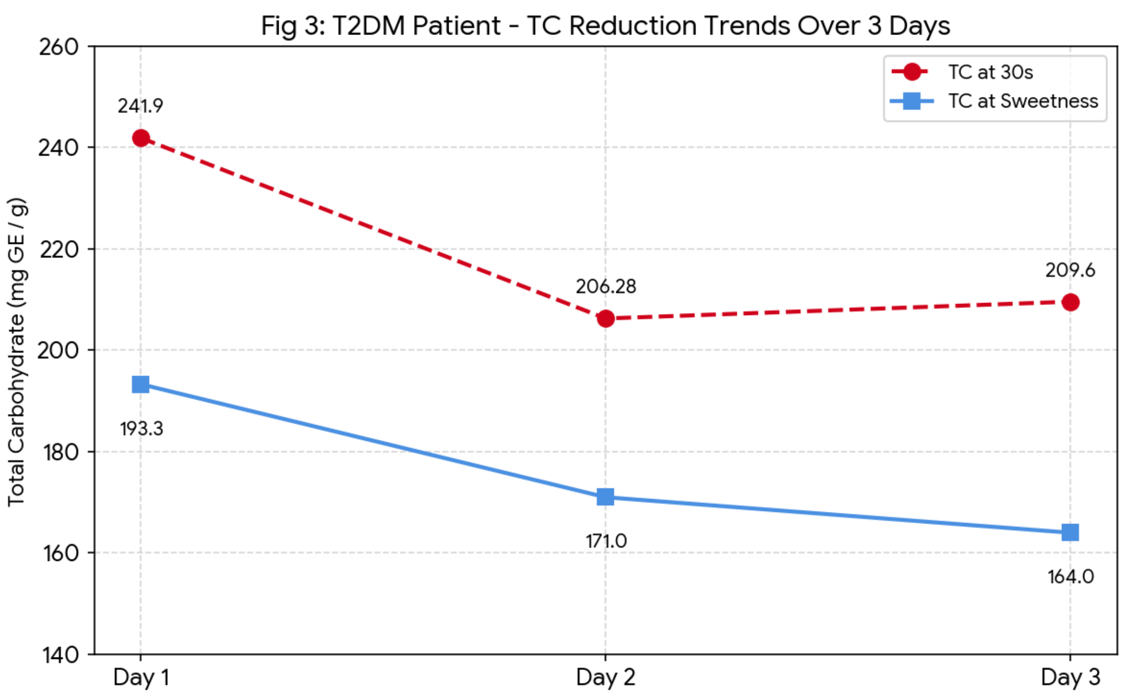

Figure 3 illustrates the consistency of the 'conscious chewing' benefit over a three-day period for the T2DM patient. In all three instances, chewing until the feeling of sweetness resulted in a marked reduction in Total Carbohydrate equivalence compared to stopping at 30 seconds.

3.4 Final Comparative Summary & Graphical Data

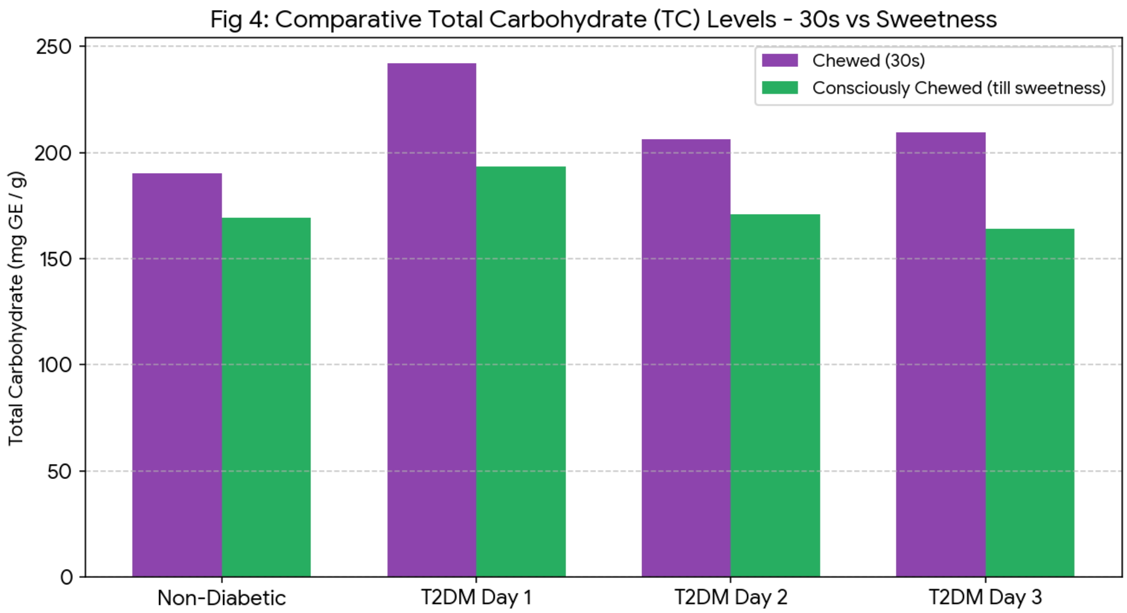

Figure 4: Comparative Total Carbohydrate variations clearly outlining the reduction achieved uniformly when transitioning from a 30-second chew to chewing until the 'feeling of sweetness' across all subjects and days.

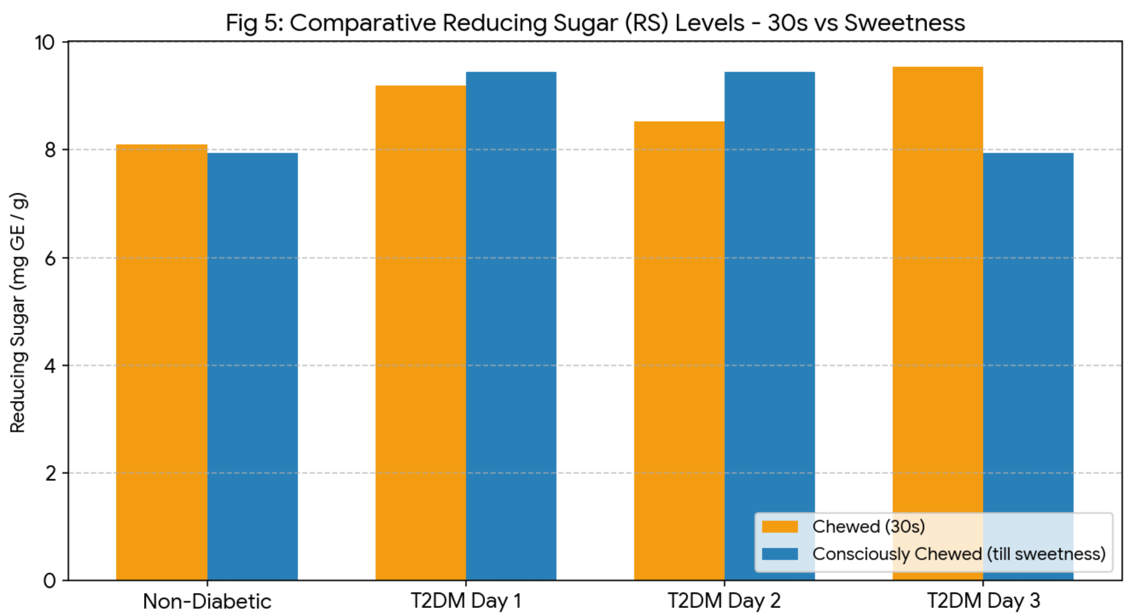

Figure 5: Comparative Reducing Sugar measurements. It highlights the divergence in T2DM stabilization over multiple days relative to the non-diabetic baseline.

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Table 9: Comparative Evaluation between Total Carbohydrate [TC] and Reducing Sugar [RS] Glucose equivalent levels.

S No.	Sample Status	TC (mg GE / g chapati)	RS (mg GE / g chapati)
1.1	Non-Diabetic (30s)	190.30	8.10
1.2	Non-Diabetic (till sweetness)	169.20	7.94
2.1	T2DM Day-1 (30s)	241.9	9.20
2.2	T2DM Day-1 (till sweetness)	193.3	9.45
2.3	T2DM Day-2 (30s)	206.28	8.53
2.4	T2DM Day-2 (till sweetness)	171.0	9.45
2.5	T2DM Day-3 (30s)	209.6	9.54
2.6	T2DM Day-3 (till sweetness)	164.0	7.94

IV. Discussion

The observations drawn from the data demonstrate clear kinetic disparities between non-diabetic and diabetic metabolic responses in the buccal cavity. In the non-diabetic subject, the TC level increased to 190.30 mg of glucose/gm of chapati between the 10-second and 30-second intervals. However, when conscious chewing was extended beyond 30 seconds until the subjective 'feeling of sweetness' was attained, the TC level decreased to 169.20. Similarly, the RS level increased to 8.10 in the initial interval but slightly decreased to 7.94 upon extended conscious chewing [9].

These physical measurements indicate that conscious chewing effectively activates the correlation principle. The matter (food particles) comprehensively mixes with salivary enzymes, converting the physical substrate into an energized, transmuted food state via vital energy movements. The physical body represents the subtle bio-molecular production: new, sweetened stuff with a decreased RS ratio (7.94) compared to the intermediate chewing phase [10].

Conversely, the T2DM subject exhibited a markedly different pattern. The TC levels demonstrated significant spikes early in the chewing process (241.9, 206.28, and 209.6 across three days) at the 30-second mark, but decreased (193.3, 171.0, and 164.0) when chewed until the feeling of sweetening. The RS levels in the diabetic subject decreased at the 30-second mark (9.20, 8.53, and 9.54) but paradoxically increased when chewed until sweetness on Days 1 and 2 (9.45) before decreasing on Day 3 (7.94) [11, 14].

The rate of metabolism of TC was observed to be slightly slower in the chewing samples of the diabetic patient compared to the non-diabetic person. In the T2DM case, where the baseline random blood glucose test was exceptionally high (233 mg/dl), the data suggests that systemic hyperglycemia severely impacts local oral enzymatic efficacy [12]. Because of the high blood glucose level, the salivary glands may be less activated, resulting in the secretion of insufficient or less potent salivary amylase (ptyalin) [15]. Consequently, the physiological transmutation and assimilation of the carbohydrate substrate into proper 'human-made sugar' is disrupted, placing undue burden on the autonomous unconscious digestion in the navel region [13, 16].

V. Conclusion

This clinical trial, supported by comprehensive graphical data encompassing daily tracking and cross-comparative endpoints, establishes that the conscious, qualitative chewing of foodstuff is a vital, objective physiological mechanism that dictates the downstream efficacy of carbohydrate metabolism. While non-diabetic individuals exhibit a smooth, correlated enzymatic response that reliably refines complex carbohydrates into bio-available simple sugars, T2DM patients demonstrate metabolic dysregulation right from the buccal cavity. The inadequate activation of ptyalin due to systemic high blood glucose alters endogenous sugar synthesis.

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Therefore, integrating the practice of prolonged 'conscious chewing' (until the feeling of sweetness is achieved) serves as a critical, non-pharmacological lifestyle intervention that can assist in managing metabolic disorders, drawing from both quantum biological correlation and fundamental Ayurvedic dietary practices.

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