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ORIGINAL RESEARCH

Glycemic index or glycemic load and dietary interventions to optimize postprandial hyperglycemia in patients with type 2 diabetes: a review - Evidence review

Dott. A. Colonnese[1]

1 Nutritional Biologist, Italy

1. ABSTRACT

The analyzed publication is a literature review that selected ten randomized clinical trials in adults with type 2 diabetes. The objective was to evaluate whether meals with a lower glycemic index, lower glycemic load, fewer carbohydrates, or more soluble fiber reduced the rise in blood sugar after a meal. Overall, most studies reported a reduction in postprandial glycemic excursions, especially when both the type and quantity of carbohydrates were modified.In section 2.1 of “The Choice to Live in Health or Illness” by Dr. A. Colonnese and R. Panzironi, the review contributes to the narrative that the glycemic index must be interpreted in the context of the entire meal: ripeness, food structure, fiber, fats, proteins, preparation, and portion size can change the glycemic response. Independent studies directly confirm the importance of glycemic load, ripeness, and meal composition. However, there are results indicating that not every change in cooking necessarily produces a measurable effect. The most prudent conclusion is that the glycemic index is informative, but it is not enough on its own to predict an individual's response to a real meal.

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MISSION

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Through articles, reviews, in-depth analyses and expert contributions, the Journal champions evidence-based medicine and science, fostering a correct interpretation of scientific data and countering misinformation. Every piece of content is developed with the aim of translating the complexity of research into understandable, useful and applicable information, while keeping intact the principles of accuracy, transparency and scientific independence.

Free from political, industrial and commercial influence, the journal stands as an authoritative and independent editorial space, dedicated to promoting scientific culture, professional development and the growth of health awareness among the public.

2. ANALYZED STUDY

The research question was whether dietary strategies based on the glycemic index (GI, a measure of how quickly a carbohydrate-containing food raises glycemia compared to a reference), glycemic load (GL, a measure combining the quality and quantity of carbohydrates), carbohydrate reduction, or increased soluble fiber intake can attenuate postprandial hyperglycemia in people with type 2 diabetes.The hypothesis was that a meal with more slowly absorbed carbohydrates, fewer available carbohydrates, or more viscous fibers would produce a smaller increase in blood glucose after the meal. The relevance concerns a time of day when, in type 2 diabetes, glucose regulation is often impaired: after a meal, the pancreas may release insulin less effectively, and tissues may respond less well to the hormone.The relevance to the book's section is specific. The publication does not directly prove that every difference in ripening, cooking, or industrial processing modifies glycemia for every food. However, it documents that the postprandial response depends on the interaction between carbohydrate quality, quantity consumed, fiber content, and the composition of the individual meal. It is therefore consistent with the statement that the GI should be interpreted in the context of the food and the complete meal, not as an isolated value.As a narrative review of short- and medium-term clinical studies, the research can summarize available results but cannot establish that a single dietary characteristic causes a specific glycemic response in every person and in every situation.

3. MATERIALS AND METHODS OF THE ORIGINAL STUDY

The authors performed an advanced search in PubMed in January 2020. They searched for studies published between 2009 and 2019, in English, conducted on humans, and classified as clinical trials or randomized controlled trials. Only primary studies on adults aged 18 to 75 with type 2 diabetes that measured glycemia after a meal were included.The selection process considered 605 titles. Subsequently, 167 abstracts were evaluated, and 54 articles were read in full. Ten studies met the final criteria. Eight had a crossover design, in which the same individuals receive different interventions at different times; two had a parallel-group design.The trials lasted from 5 days to 22 months and included between 10 and 162 participants. Six compared low-GI meals with higher-GI meals. Three compared meals with a lower carbohydrate content with higher-carbohydrate meals. One compared different combinations of GI and fiber. The main measures were postprandial glycemia, often expressed as the incremental area under the curve, which is the total amount of increase in glycemia over time compared to the initial value.The authors also included interventions with a lower carbohydrate content because a lower proportion of carbohydrates reduces the GL of the meal. This choice broadens the topic from the mere classification of foods to the metabolic behavior of complete meals. No uniform protocols for all studies are reported in the available material, nor is there a quantitative meta-analysis of the aggregated effects.

4. RESULTS

The overall result is that most of the ten selected studies observed a statistically significant reduction in postprandial hyperglycemia with at least one strategy involving a reduction in GI or GL. In practical terms, many interventions attenuated the glucose spike after a meal, but not all produced the same effect, and the studies differed in duration, participants, therapies, and meal composition.In comparisons between meals with different GI, a low-GI diet associated with low-GI meals produced lower postprandial glycemia compared to the same general diet with a high-GI meal. In one included study, the difference after breakfast was statistically significant with $P<0.001$. This suggests that even a single meal can influence the acute outcome, regardless of the average quality of the diet.The review also reports that a breakfast with less than 10% of energy from carbohydrates reduced the post-breakfast glycemic response by 74% compared to a breakfast with a higher carbohydrate content. In the same comparison, the incremental area under the glucose curve over 24 hours was 32% ± 30% lower. Since lunch and dinner did not differ between the conditions, this data indicates an effect concentrated primarily in the first part of the day; it does not prove that a single breakfast permanently modifies long-term glycemic control.Regarding fiber, some studies showed that increasing soluble fiber in a breakfast reduced postprandial glycemia. In a

comparison with isocaloric meals—that is, with the same amount of energy—a low-GI and higher-fiber breakfast reduced the glycemic area compared to a high-GI breakfast; the reported difference was 46%. However, in several studies, the foods could not be made perfectly identical in terms of macronutrients, fiber, and carbohydrate content. Therefore, it is not always possible to attribute the effect to a single factor.A result particularly relevant to the book is that the GI of a food is not enough to describe the metabolic behavior of a meal. The authors report that the amount of carbohydrates, fiber, protein, fat, portion size, physical structure of the food, pH, gastric emptying, and the sequence of nutrient consumption can all modify postprandial glycemia. However, the review does not separately quantify the effect of ripening, cooking, industrial processing, or the combination of ingredients in all foods.

5. INTERPRETATION

The primary biological significance is simple: after a meal, it is not just the amount of carbohydrates present that matters, but also how quickly they become available glucose and how much glucose is made available in the portion consumed. A food or meal with a lower GI tends to release glucose more gradually; a meal with a lower GL combines this characteristic with a lower overall amount of available carbohydrates.The scientific detail is that soluble fiber, food structure, and meal composition can slow down starch digestion, gastric emptying, or intestinal absorption. Proteins and fats can also alter the secretion of intestinal hormones and the insulin response. These mechanisms help explain why two meals with a similar amount of carbohydrates can generate different glycemic curves.The segment documented by the publication subject to the Evidence Review is therefore: meal characteristics, in particular the type and quantity of carbohydrates together with fiber and other nutrients, variation in the speed and magnitude of the postprandial glycemic response. This supports the need not to interpret the GI as an immutable property sufficient to describe an actual meal.The interpretative limitation is significant. The review mainly examines people with type 2 diabetes and interventions that are often short, numerically small, and non-uniform. It does not allow for the conclusion that a single GI value precisely predicts the glycemia of every individual, nor that any culinary modification always has the same effect.

6. INDEPENDENT CONFIRMATORY EVIDENCE

Direct confirmation of the idea that a meal should be evaluated based on the quality and quantity of carbohydrates comes from a randomized study conducted on healthy young adults. Participants consumed 121 individual foods and 13 mixed meals. Glycemic Load (GL) was found to be the strongest predictor of glycemic and insulin response after mixed meals: it explained 58% and 46% of the observed variability, respectively, whereas the quantity of carbohydrates alone did not significantly predict these responses in mixed meals. This confirms that the metabolic effect is not adequately described by carbohydrate counting alone [1]. The limitation is that the participants were healthy and young, so the result does not directly quantify the effect in type 2 diabetes.A small crossover study in ten people with type 2 diabetes examined a characteristic mentioned in the book: the degree of ripeness. The same individuals consumed unripe and very ripe bananas on different days. The glycemic index of the unripe banana was 43 ± 10, while that of the very ripe banana was 74 ± 9; the difference was statistically significant. The area of the glycemic response was also smaller with the unripe banana compared to the ripe one [2]. This data confirms, in the context of type 2 diabetes, that ripeness can change the glucose response, but it concerns a specific fruit and a very small sample.A further randomized crossover study in 13 healthy adults verified that the combination of ingredients can attenuate or reduce the initial differences between two carbohydrate-rich foods. When consumed plain, rice and spaghetti had a GI of 63 ± 3 and 44 ± 7, respectively. The incremental area of glycemia was greater for rice than for spaghetti. After adding condiments containing fats, the differences between the glycemic peaks were no longer significant [3]. This evidence specifically supports the section of the book on ingredient combinations. However, it does not prove that adding fats is in itself a healthy strategy or suitable for everyone: it describes an acute response in a small, healthy sample.Taken together, these independent studies reconstruct a coherent chain: quality of the carbohydrate and its structure speed of

digestion and absorption; quantity present in the portion magnitude of glucose exposure; ingredients associated in the meal further modification of the glycemic curve. The original research contributes above all to the final link between these characteristics and lower postprandial hyperglycemia in people with type 2 diabetes.

7. CONFLICTING EVIDENCE

Not all changes in culinary preparation necessarily produce a detectable variation in glycemia. In a crossover study of 12 healthy volunteers, three pasta meals with the same amount of starch were prepared with cooking times of 11, 16.5, and 22 minutes. No significant differences emerged between the conditions in postprandial glycemia or insulinemia [4].This result does not contradict the general idea that structure, preparation, and composition can influence the glycemic response. However, it defines an important limit: the effect depends on the food, the specific range of preparation examined, the portion size, the associated ingredients, and the individual's characteristics. In the case of the pasta studied, the cooking times compared were not sufficient to measurably alter metabolic indices.The variability observed in studies therefore indicates that it would be incorrect to treat every change in ripening or cooking as a universal rule. No directly conflicting evidence has been identified that is sufficiently relevant to the general principle that the context of the meal influences the glycemic response; this does not prove the absence of contrary results.

8. QUADRO COMPARATIVO E SINTESI DELLE EVIDENZE

The table distinguishes the original study from the independent publications used to confirm or define the scope of the book's passage.

Quadro comparativo

Reference	Study type	Population or model	Main result	Direction of evidence	Strength of evidence
Original study	Review of 10 randomized trials	Adults with type 2 diabetes; studies of 10 to 162 participants	Meals with lower GI or GL, with fewer carbohydrates or more soluble fiber, often reduced postprandial glycemia	biologically consistent evidence	moderate
[1]	Randomized study of meals and foods	Healthy young adults; 121 foods and 13 mixed meals	Glycemic load predicted the glycemic and insulin response of mixed meals better than carbohydrate quantity alone	direct confirmation	moderate
[2]	Crossover study	10 people with type 2 diabetes	Unripe banana had a lower GI and glycemic response compared to very ripe banana	direct confirmation	low
[3]	Randomized crossover trial	13 healthy adults	Fat-containing condiments reduced or eliminated glycemic differences between rice and spaghetti	direct confirmation	low

[4]	Randomized crossover trial	12 healthy volunteers	Three pasta cooking times did not produce significant differences in glycemia or insulinemia	discordant evidence	low

9. SINTESI EDITORIALE E CONCLUSIONI

CONCLUSIONS

The analyzed publication provides fairly robust support for the idea that, in type 2 diabetes, post-meal glycemia can be reduced by adjusting the quality and quantity of carbohydrates, as well as the content of soluble fiber. Its contribution to the book chapter primarily clarifies that the glycemic index should not be interpreted outside the context of portion size and the overall meal.Independent evidence confirms that glycemic load, the ripeness of certain foods, and the combination of ingredients can alter the postprandial response. However, the effects depend on the type of food, the specific preparation, and the individual. The narrative is therefore well-supported, but it does not justify rigid rules applicable indiscriminately to all foods and all people.

Aggiornato al 17/11/2026. Questo contenuto riflette una sintesi divulgativa delle evidenze scientifiche al momento della pubblicazione e non sostituisce il parere medico.

10. TRANSPARENCY AND SCIENTIFIC RESPONSIBILITY

Artificial Intelligence was used solely as a tool for editorial and documentary support. All content, interpretations, bibliographic citations and conclusions have been verified, reviewed and approved by the author, who assumes full scientific responsibility for them.

The manuscript was also subjected to independent peer review prior to publication.

To ensure the greatest transparency, the complete history of the article, including the dates of submission, revision, acceptance and publication, as well as information on the peer review process, is available on the dedicated Article History page.

11. RIFERIMENTI BIBLIOGRAFICI

[1] **Prediction of postprandial glycemia and insulinemia in lean, young, healthy adults: glycemic load compared with carbohydrate content alone**
Bao et al., 2011
The American Journal of Clinical Nutrition
DOI: https://doi.org/10.3945/ajcn.110.005033

[2] **Influence of Ripeness of Banana on the Blood Glucose and Insulin Response in Type 2 Diabetic Subjects**
Hermansen et al., 1992
Diabetic Medicine
DOI: https://doi.org/10.1111/j.1464-5491.1992.tb01883.x

[3] **The importance of glycemic index on post-prandial glycaemia in the context of mixed meals: A randomized controlled trial on pasta and rice**
Chiavaroli et al., 2021
Nutrition, Metabolism and Cardiovascular Diseases
DOI: https://doi.org/10.1016/j.numecd.2020.09.025

[4] **Pasta cooking time: influence on starch digestion and plasma glucose and insulin responses in healthy subjects**
Bornet et al., 1990
The American Journal of Clinical Nutrition
DOI: https://doi.org/10.1093/ajcn/51.3.421