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ORIGINAL RESEARCH

A high-glycemic index, low-fiber breakfast influences postprandial plasma glucose, insulin, and ghrelin responses in patients with type 2 diabetes in a randomized clinical trial - Evidence review

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1. ABSTRACT

The original study compared four breakfasts with different glycemic indices and fiber content in 14 people with type 2 diabetes. The high-glycemic index and low-fiber combination was associated with the least favorable postprandial response: greater glucose exposure compared to the low-glycemic index and high-fiber breakfast, and greater insulin exposure compared to breakfasts with more fiber.In "The Choice to Live in Health or Illness" by Dr. A. Colonnese and R. Panzironi, the study contributes to the narrative that carbohydrate quality and fiber work together to modulate the insulin response after a meal. Independent studies consistently confirm that breakfasts with a lower glycemic index or glycemic load and more fiber primarily reduce postprandial glycemia. Confirmation of the effect on insulin is more variable and depends on the meal composition, therapy, and duration of observation.

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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, in people with type 2 diabetes, simultaneously modifying the glycemic index and the amount of fiber in breakfast would change the glucose, insulin, and ghrelin response over the following three hours. The glycemic index indicates how quickly a carbohydrate-containing food tends to increase glycemia compared to a reference; ghrelin is a hormone involved in hunger regulation.The hypothesis was that a breakfast with a lower glycemic index, more fiber, or both characteristics would produce a more favorable postprandial metabolic profile. The relevance to the section "The Choice to Live in Health or Illness" by Dr. A. Colonnese and R. Panzironi is precise: the publication tests, within the same experimental design, the interaction between carbohydrate quality and fiber content in the insulin response after breakfast.As this is an acute, small-scale study conducted under controlled conditions, it can show immediate differences between those four breakfasts in the participants studied. It cannot prove that the same dietary choice prevents diabetes complications, reduces insulin resistance in the long term, or produces identical effects in all people with diabetes.

3. MATERIALS AND METHODS OF THE ORIGINAL STUDY

This was a randomized crossover clinical trial with four interventions: each participant consumed all the planned breakfasts in a randomized order, thus serving as their own control. The study included 14 patients with type 2 diabetes, seven men, with a mean age of 65.8 ± 5.2 years, a mean glycated hemoglobin of 6.6 ± 0.9%, and a mean body mass index of 27.2 ± 3.1 kg/m².The breakfasts were: high glycemic index and high fiber, with a glycemic index of 60.4 and 6.0 g of fiber; high glycemic index and low fiber, with a glycemic index of 60.9 and 2.5 g of fiber; low glycemic index and high fiber, with a glycemic index of 37.7 and 6.2 g of fiber; and low glycemic index and low fiber, with a glycemic index of 39.8 and 2.0 g of fiber.Plasma glucose, insulin, and total ghrelin were measured from zero to 180 minutes after the meal. Perceived hunger and satiety were recorded using a visual analog scale, i.e., a graduated line on which the participant indicates the intensity of the sensation. The authors analyzed the data using generalized estimating equations and post hoc comparisons. Detailed inclusion and exclusion criteria, characteristics of antidiabetic therapies, the exact duration of the study, the complete composition of the meals, and the interval between visits are not reported in the available material, which consists only of the abstract.

4. RESULTS

The most significant result was observed when a high glycemic index and low dietary fiber content were present together. The area under the curve, or AUC, represents the overall exposure to a substance over time: a higher glucose value indicates that glycemia remained higher overall during the observed period.The glucose AUC was higher after the high glycemic index and low-fiber breakfast, at 9.62 mmol/L × min, compared to the low glycemic index and high-fiber breakfast, at 8.95 mmol/L × min; the difference was statistically significant according to the test reported by the authors, with $P \leq 0.05$. This data indicates greater postprandial glucose exposure in the less favorable combination.The insulin AUC, which is the total amount of circulating insulin over three hours, was also higher with the high glycemic index and low-fiber breakfast: 65.72 µIU/mL × min compared to 57.24 µIU/mL × min after the high glycemic index and high-fiber breakfast, with $P \leq 0.05$. Furthermore, at a low glycemic index, the insulin AUC was higher with low fiber compared to high fiber: 61.54 versus 54.16 µIU/mL × min, with $P \leq 0.05$. In both comparisons, increased fiber was associated with a lower insulin response.Ghrelin decreased compared to the baseline value only after the two low glycemic index breakfasts, regardless of the amount of fiber, with $P \leq 0.05$. However, subjective satiety did not differ between the four breakfasts. The study therefore notes a hormonal variation consistent with the lower glycemic index, but does not demonstrate that the participants perceived less hunger.

5. INTERPRETATION

In simple terms, the result suggests that it is not just the amount of carbohydrates at breakfast that matters, but also the speed at which they are absorbed and the presence of components, such as fiber, that can slow down or modify the response to the meal. In the study,

the combination of a high glycemic index and low fiber resulted in the highest glucose and insulin exposure among the statistically significant comparisons reported.The finding documented directly by the publication is therefore: a breakfast with a high glycemic index and low fiber content can increase the postprandial insulin response compared to breakfasts with more fiber, while the combination of a low glycemic index and high fiber reduced glucose exposure compared to the opposite combination. This supports the part of the book's narrative regarding the complementary action of carbohydrate quality and fiber.However, the data do not allow for a complete separation of the causal effect of the glycemic index from that of fiber, because the breakfasts differed in both characteristics simultaneously. Furthermore, ghrelin is a biological marker and does not automatically equate to a lasting change in appetite or food intake, especially since the satiety reported by the participants did not change.

6. INDEPENDENT SUPPORTING EVIDENCE

Direct confirmation of the nutritional aspect of this narrative comes from a randomized crossover study conducted on 45 adults with type 2 diabetes. A low glycemic load breakfast containing 6.6 g of soluble psyllium fiber produced significantly lower glucose and insulin AUC compared to a high glycemic load breakfast without psyllium. The study does not allow the result to be attributed solely to the fiber, as the glycemic load, carbohydrate quantity, and energy content also differed, but it confirms the direction observed in the original study: a morning meal with a lower glycemic impact and more fiber can reduce both postprandial glycemia and insulinemia [1].A second randomized crossover study further isolated the contribution of fiber. In 19 people with type 2 diabetes, two isocaloric breakfasts with approximately 9 g of total fiber reduced the incremental glucose AUC compared to a breakfast with 2.4 g of fiber. The effect was similar whether the fiber came from food or guar gum. The insulin AUC, however, was not significantly different. This research confirms that more fiber can attenuate glycemia after breakfast, but shows that a parallel reduction in insulin is not inevitable in every context [2].A meta-analysis of randomized breakfast studies found that lowering the glycemic index and glycemic load reduces the postprandial glycemic response at 60, 90, and 120 minutes. The reduction appeared more pronounced in people with metabolic disorders. The analysis therefore strengthens the link between carbohydrate quality and a smaller increase in glycemia after breakfast, but does not by itself demonstrate which component of the meal, including fiber, is responsible for the effect in every single study [3].

7. CONFLICTING EVIDENCE

The evidence is not conflicting regarding the general direction of the glycemic response, but it does scale back the idea that a low-glycemic index, high-fiber breakfast necessarily reduces insulin in every measure and at every time of day. In a four-week randomized crossover study conducted on 13 men with type 2 diabetes, a low-glycemic index breakfast with 3 g of beta-glucan reduced post-breakfast glucose spikes and AUC compared to a high-glycemic index breakfast. However, it did not change fasting insulin, glycated hemoglobin, or the glucose or insulin response to the subsequent meal [4].This result is relevant because it suggests that the immediate benefit to glycemia does not automatically imply a persistent effect on insulin or a change in average glycemic control. Differences in pharmacological therapy, the sex of the participants, the quantity and type of fiber, the overall composition of the meal, and the observation period may explain part of the variability. No directly conflicting evidence sufficiently relevant to the acute increase in insulin observed in the original study has been identified; this does not prove the absence of contrary results.

8. QUADRO COMPARATIVO E SINTESI DELLE EVIDENZE

The table distinguishes direct experimental evidence on a single meal from study syntheses and results that limit their generalizability.

Quadro comparativo

Reference	Study type	Population or model	Main result	Direction of evidence	Strength of evidence
Original study	Acute crossover RCT	14 people with type 2 diabetes	High-glycemic index, low-fiber breakfast increased glucose AUC compared to low-index, high-fiber, and insulin AUC compared to higher-fiber breakfasts.	direct confirmation	moderate
[1]	Crossover RCT	45 adults with type 2 diabetes	A low-glycemic load breakfast with psyllium reduced glucose and insulin AUC compared to a high-load breakfast without psyllium.	direct confirmation	moderate
[2]	Crossover RCT	19 people with type 2 diabetes	Higher-fiber breakfasts reduced incremental glucose AUC; insulin AUC did not change significantly.	indirect confirmation	moderate
[3]	Meta-analysis of RCTs	Adults, including subjects with metabolic disorders	Lower-glycemic index and load breakfasts reduced postprandial glycemia at 60, 90, and 120 minutes.	biologically consistent evidence	moderate
[4]	Four-week crossover RCT	13 men with type 2 diabetes	Low-glycemic index and beta-glucan breakfast reduced postprandial glycemia, but not fasting insulin or insulin response to the subsequent meal.	discordant evidence	low

9. SINTESI EDITORIALE E CONCLUSIONI

CONCLUSIONS

The study analyzed directly supports the idea that the combination of a high glycemic index and low dietary fiber can produce a less favorable postprandial response in people with type 2 diabetes. Independent evidence quite consistently confirms a reduction in glycemia with breakfasts that have a lower glycemic index or glycemic load and higher fiber content. The effect on insulin is moderately supported, but it varies between studies and requires larger trials with comparable meals and prolonged observations.

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.

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