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ORIGINAL RESEARCH

Impact of overweight and glucose tolerance on postprandial responses to high and low glycemic index meals - Review of the evidence

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1. ABSTRACT

The analyzed study compared metabolic responses following low or high glycemic index meals in 48 adults, categorized by body weight and glucose tolerance. The low glycemic index meal produced lower glycemia and insulin responses, while higher insulin concentrations were observed in overweight participants with impaired glucose tolerance.In the narrative of “The Choice to Live in Health or Illness” by Dr. A. Colonnese and R. Panzironi, the publication helps demonstrate that the quality of carbohydrates influences the insulin response even in the presence of metabolic alterations. Independent studies on mixed meals and controlled diets generally confirm the acute reduction of glycemia and insulinemia when the glycemic index or glycemic load is decreased. However, a long-term trial in people with impaired glucose tolerance observed an increase in mean insulinemia with a low glycemic index diet. The confirmation is therefore moderate and dependent on the overall composition of the diet.

ONLINE ARTICLE

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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.

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2. ANALYZED STUDY

The research question was whether being overweight and having impaired glucose tolerance would modify the blood response following meals with different glycemic indices. The glycemic index indicates how quickly carbohydrate-containing foods tend to increase glycemia compared to a reference food. A lower index generally describes a less rapid increase in glycemia, but it does not, by itself, summarize the actual amount of carbohydrates consumed.The hypothesis evaluated was that individual metabolic characteristics, particularly being overweight and having impaired glucose tolerance, could influence postprandial glucose, insulin, and lipid responses. The relevance to paragraph 2.1.1 is specific: the publication documents that, in the overall comparison between the experimental meals, the low glycemic index meal was followed by a lower insulin response compared to the high glycemic index meal.The study can show short-term differences in blood concentrations after those two meals in the individuals examined. It cannot demonstrate that a single meal prevents diabetes, corrects insulin resistance, or reduces the functional load on pancreatic beta cells in the long term. Furthermore, since only the abstract is available, it is not possible to verify the details necessary to establish how identical the effect of the low glycemic index meal was in each of the four subgroups.

3. MATERIALS AND METHODS OF THE ORIGINAL STUDY

The study included 48 participants: 24 of normal weight and 24 overweight. Within each of these groups, there were 12 people with normal glucose tolerance and 12 with impaired glucose tolerance. The latter condition means that the body manages glucose less effectively after a sugar load, although it does not necessarily correspond to overt diabetes.Each participant consumed each of the two experimental meals once: one with a low glycemic index and one with a high glycemic index. The glucose reference was taken twice. Glycemia and insulin were measured while fasting and during the two hours following the meals. Triacylglycerols or TAGs (the main form of circulating fats) and non-esterified fatty acids or NEFAs (free fats in the blood) were measured while fasting and for five hours after the meal.The abstract does not report the precise composition of the two meals, their energy content, the amount of carbohydrates, fiber, protein, and fat, the order of administration, any randomization, the inclusion and exclusion criteria, the recruitment period, the laboratory analytical methods, or the detailed statistical plan. This information is not provided in the available material.

4. RESULTS

The main finding is that the low-glycemic index meal resulted in a lower glucose response compared to the high-glycemic index meal, with high statistical significance ($P<0.001$). Simply put, after the meal, glycemia increased less in the low-glycemic index diet group. The insulin response was also lower after the low-glycemic index meal ($P<0.001$): the pancreas released less insulin overall during the observed period.The glycemic responses of people with impaired glucose tolerance were significantly different from those of people with normal tolerance. Higher insulin responses, after both meals, were observed in overweight participants with impaired glucose tolerance. This finding is consistent with a greater demand for insulin to manage glucose, but it does not directly measure either beta-cell function or insulin resistance with a specific test.The low glycemic index did not reduce all metabolic indicators. Compared to the high-glycemic index meal, it increased the TAG response ($P<0.001$), while it did not change the NEFA response. The physiological characteristics of the participants did not alter the TAG or NEFA responses, or the relative glycemic response to the meals. The abstract does not report absolute values, confidence intervals, the magnitude of the differences, interaction analyses between subgroups, or separate results for each weight and glucose tolerance category.

5. INTERPRETATION

For the reader, the core meaning is simple: under the same experimental conditions adopted by the authors, the type of carbohydrates chosen for the meal changed the amount of circulating glucose and insulin in the following hours. The result is particularly relevant to the passage in the book stating that the quality of carbohydrates still plays a role in the insulin response even when overweight or impaired glucose tolerance is present.The segment of the chain directly

documented by the study is: low glycemic index meal lower postprandial increase in glycemia lower overall insulin response. The observation of higher insulin concentrations in overweight individuals with impaired glucose tolerance adds an element of individual heterogeneity: for the same meal, the response is not the same for everyone.The publication does not prove that the glycemic index is the only determinant of insulinemia. In real-world meals, the quantity of carbohydrates, fiber, fats, proteins, food structure, and portion size also matter. Furthermore, the increase in TAGs after the low glycemic index meal serves as a reminder that a lower glycemic and insulin response does not automatically equate to an improvement in every metabolic parameter.

6. INDEPENDENT SUPPORTING EVIDENCE

A first crossover study examined four meals in 12 women with obesity and normal glucose tolerance. With equal meal size, high-glycemic index meals produced an incremental area under the glucose and insulin curve nearly double that of low-glycemic index meals. The area under the curve summarizes how much a value increases over time after a meal. This work directly confirms the point that a higher glycemic index can increase the acute insulin response. It also showed that when different meals had a similar glycemic load, glucose and insulin responses were very similar: the quality and quantity of carbohydrates must therefore be considered together [1]. The sample was small, consisting only of women with obesity and lacking people with impaired glucose tolerance.In a randomized crossover study, 26 overweight or obese adults received four meal combinations, varying glycemic index and carbohydrate content. Reducing the glycemic index or the amount of carbohydrates reduced postprandial glycemia and insulinemia over twelve hours. The combination of a low glycemic index and lower carbohydrate content produced the lowest daily insulin response. This confirms the direction observed in the original study and, at the same time, supports the other sentence in the book: the quantity of carbohydrates integrates with their quality in determining the postprandial effect [2]. The main limitation is the small sample size and the duration of only one experimental day.A further randomized crossover trial provided controlled high or low glycemic load diets for 28 days to 84 healthy normal-weight or overweight-obese adults; 80 completed the study and 20 underwent the postprandial test. After the low glycemic load breakfast, the mean postprandial glucose response was 43% lower and the insulin response 27% lower compared to the high glycemic load breakfast. No change in the effect was observed based on adiposity. This result is biologically consistent with the book's narrative, although it concerns glycemic load, which combines glycemic index and carbohydrate quantity [3]. Fiber was higher in the low glycemic load diet, so the study cannot attribute the effect to the glycemic index alone.

7. CONFLICTING EVIDENCE

A four-month randomized trial involving 34 people with impaired glucose tolerance compared a high-glycemic index diet, a low-glycemic index diet, and a diet lower in carbohydrates and higher in monounsaturated fats. Compared to the high-glycemic index diet, both the low-glycemic index diet and the lower-carbohydrate diet reduced mean postprandial glycemia by 0.35 mmol/L over eight hours. However, following the low-glycemic index diet, mean insulinemia was approximately 20% higher and NEFA levels were approximately 12% lower compared to the high-glycemic index diet [4].This evidence does not negate the acute result of the analyzed study, as the duration, diet composition, and metabolic adaptation context differ. It does, however, show that a reduction in the glycemic index does not always ensure lower mean insulinemia when the entire diet is modified over several months. The direction of the effect depends on the overall diet and cannot be inferred from the glycemic index alone.

8. QUADRO COMPARATIVO E SINTESI DELLE EVIDENZE

The table distinguishes the study that is the subject of the Evidence Review from the independent publications used to confirm or define the narrative passage of the book.

Quadro comparativo

Reference	Study type	Population or model	Main result	Direction of evidence	Strength of evidence
Original study	Postprandial experimental study	48 adults: normal weight or overweight, with normal or impaired glucose tolerance	Low glycemic index meal reduced glycemia and insulinemia compared to high glycemic index meal; higher TAG.	direct confirmation	moderate
[1]	Randomized crossover study	12 women with obesity and normal glucose tolerance	High glycemic index meals produced glucose and insulin responses nearly double those of low glycemic index meals of equal size.	direct confirmation	moderate
[2]	Crossover RCT	26 overweight or obese adults	Reducing glycemic index or carbohydrates reduced postprandial glycemia and insulinemia over twelve hours.	direct confirmation	moderate
[3]	Crossover RCT with controlled feeding	84 healthy normal-weight or overweight-obese adults; postprandial test in 20 participants	Low glycemic load breakfast reduced postprandial glucose by 43% and insulin by 27%.	biologically consistent evidence	moderate
[4]	Parallel-group RCT	34 people with impaired glucose tolerance	Low glycemic index diet: lower mean postprandial glycemia but mean insulinemia about 20% higher compared to high glycemic index diet.	discordant evidence	moderate

9. SINTESI EDITORIALE E CONCLUSIONI

CONCLUSIONS

The study analyzed directly supports the idea that, in the experimental context examined, a low-glycemic index meal triggers a lower glucose and insulin response compared to a high-glycemic index meal. It also shows that being overweight and having impaired glucose tolerance are associated with higher insulin responses after both types of meals.Independent evidence quite consistently confirms the acute reduction in insulinemia when the glycemic index or glycemic load is lowered. It is also well-supported that the amount of carbohydrates modifies this effect. However, generalizing these findings to all individuals and long-term dietary interventions remains less certain, as the overall composition of the diet, fiber, fats, and metabolic adaptation can alter the insulin response.

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] **Acute effect of meal glycemic index and glycemic load on blood glucose and insulin responses in humans**
Galgani et al., 2006
Nutrition Journal
DOI: https://doi.org/10.1186/1475-2891-5-22

[2] **Reducing the Glycemic Index or Carbohydrate Content of Mixed Meals Reduces Postprandial Glycemia and Insulinemia Over the Entire Day but Does Not Affect Satiety**
Liu et al., 2012
Diabetes Care
DOI: https://doi.org/10.2337/dc12-0329

[3] **Glycemic load effect on fasting and post-prandial serum glucose, insulin, IGF-1 and IGFBP-3 in a randomized, controlled feeding study**
Runchey et al., 2012
European Journal of Clinical Nutrition
DOI: https://doi.org/10.1038/ejcn.2012.107

[4] **Long-term effect of varying the source or amount of dietary carbohydrate on postprandial plasma glucose, insulin, triacylglycerol, and free fatty acid concentrations in subjects with impaired glucose tolerance**
Wolever et al., 2003
The American Journal of Clinical Nutrition
DOI: https://doi.org/10.1093/ajcn/77.3.612