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ORIGINAL RESEARCH

Postprandial glycemic profiles and insulin variability in type 2 diabetes

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1. ABSTRACT

The analyzed study examined whether continuous glucose monitoring could distinguish, following a standardized meal, glycemic profiles associated with different metabolic characteristics in 100 people with type 2 diabetes. Three profiles were identified: the one with the highest peak and persistently elevated glycemia showed lower insulin secretion and greater insulin resistance; the one with a more rapid rise and fall presented a higher early insulin response.In section 3.1.1 of “The Choice to Live in Health or Illness” by Dr. A. Colonnese and R. Panzironi, the study contributes to the narrative that the glycemic curve after a meal can reflect different pathophysiological mechanisms that are not recognizable by common clinical characteristics alone. Independent studies, especially in people without diabetes undergoing an oral glucose tolerance test, confirm that higher early glycemia is often associated with worse beta-cell function and, in some contexts, lower insulin sensitivity. However, intestinal glucose absorption also contributes to early excursions. The confirmation is therefore moderate and does not yet prove that these profiles should guide personalized therapies.

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MISSION

LIFE Science Hub – Journal of Science was founded with the aim of making scientific knowledge accessible without giving up methodological rigour, quality of sources and authoritativeness of content. The journal promotes the dissemination of knowledge in the health, nutrition, medical and longevity sciences, building a bridge between the world of research and society.

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 the different patterns of glycemia in the four hours following a standardized meal could identify subgroups of people with type 2 diabetes characterized by different metabolic defects. The hypothesis was that a curve with very high glucose levels and a slow decline reflected, at least in part, less effective insulin secretion and a reduced tissue response to insulin.This question is relevant to section 3.1.1 of "The Choice to Live in Health or Illness" by Dr. A. Colonnese and R. Panzironi because the text describes postprandial curves as potential indicators of the mechanisms that regulate glucose. The study does not verify whether post-meal alterations appear before the onset of diabetes, nor does it demonstrate that a specific glycemic profile determines subsequent clinical deterioration. Instead, it shows a cross-sectional association: people with different curves exhibited, during the same observation period, different indices of pancreatic beta-cell function and insulin resistance.

3. MATERIALS AND METHODS OF THE ORIGINAL STUDY

The study used cross-sectional data, meaning it was collected without following participants over time, from 100 people with type 2 diabetes. Each participant consumed a standardized meal twice and was monitored for four hours using continuous glucose monitoring or CGM (a sensor that repeatedly detects glucose in the interstitial fluid).The authors evaluated the height of the glycemic peak, the incremental area under the curve or iAUC (a measure of the overall increase in glucose compared to the baseline value), the rate of rise and fall, and the difference between final glycemia and fasting glycemia. These variables were grouped using a statistical analysis called K-Means, which is useful for identifying profiles with similar characteristics. The reproducibility of the classification was evaluated with a Random Forest classifier trained on the data from the first meal.In 50 participants, blood glucose and insulin were measured after the meal. The HOMA2-B% indices, an estimate of the basal secretory capacity of beta cells, and HOMA-IR, an estimate of insulin resistance based on fasting glucose and insulin, were then compared. The groups were compared using one-way analysis of variance. Inclusion and exclusion criteria, recruitment site, nutritional composition of the meal, duration of the disease in individual groups, complete values of postprandial analyses, and further statistical details are not reported in the available material, which consists only of the abstract.

4. RESULTS

The analysis identified three profiles. Group 1 included 19 people and had the highest glycemic peak and iAUC; at the end of the observation, glycemia remained above the initial value. Group 2 included 56 people, and group 3 included 25. These last two groups had lower peaks and iAUC compared to group 1, but group 3 showed a faster rise and fall in glucose compared to group 2.Age, sex, body mass index, and duration of diabetes did not differ between the three groups. However, the use of metformin was less frequent in group 3; this represents a possible differentiating factor between the profiles. Group 1 had a lower basal insulin secretion compared to group 3: HOMA2-B% equal to 77.42 ± 25.64 versus 104.96 ± 43.94. It also had greater insulin resistance: HOMA-IR equal to 7.94 ± 3.27 versus 4.84 ± 2.78.In practice, people with the highest curve and the slowest return to the initial value simultaneously presented a lower estimated capacity to produce insulin and lower insulin effectiveness in the tissues. Group 3, characterized by more rapid glycemic variations and lower peak values, showed a greater early insulin response. The insulinogenic index at 60 minutes was 1.67 ± 1.07 in group 3, compared to 0.84 ± 0.31 in group 2 and 0.84 ± 0.58 in group 1. The complete P-value related to this comparison and the other subsequent results are not reported in the available material, because the provided abstract is cut off after the indication “p”.

5. INTERPRETATION

The simplest interpretation of the result is that not all elevated glycemia levels after a meal appear to have the same biological profile. A high and persistent curve may be associated with both a less adequate insulin response and greater difficulty for tissues to utilize glucose. Conversely, a curve that rises and falls more rapidly may be compatible with a relatively more efficient initial insulin response.The segment of the book's narrative directly documented by the

analyzed study is therefore: postprandial glycemic profile detected via CGM differences in insulin secretion indices and insulin resistance. This is consistent with the idea of a "metabolic signature," provided the expression is understood as a description of an association between the shape of the curve and metabolic status, rather than a causal diagnosis of individual mechanisms.The strength of the inference is limited by the cross-sectional design, the subgroup of only 50 people with plasma measurements, and the possible influence of treatments, including the varying frequency of metformin use. Furthermore, CGM measures glucose in the interstitial fluid and does not, on its own, demonstrate which process caused a specific curve. To attribute a curve to insulin secretion, insulin sensitivity, gastric emptying, or intestinal absorption, specific physiological measurements are required.

6. INDEPENDENT CONFIRMING EVIDENCE

Initial confirmation of the link between early glucose elevation and reduced compensatory capacity of beta cells comes from a study of 113 overweight or obese adolescents without diabetes. Participants with a one-hour blood glucose level during an oral glucose tolerance test of 155 mg/dL or higher had a lower disposition index compared to those below this threshold (295.1 ± 27.4 versus 498.6 ± 37.7 mg/kg/min, with $P < 0.001$). The disposition index integrates insulin secretion and insulin sensitivity: a lower value indicates that the pancreas is less effective at compensating for insulin resistance. In the multivariate analysis, it was the primary determinant of one-hour glycemia and explained approximately 21% of its variability [1]. This model differs from postprandial CGM in established diabetes, but it confirms the biological consistency between high early glycemic excursion and impaired beta-cell function.A physiological study conducted on 305 non-diabetic adults, who were children of people with type 2 diabetes, strengthened this chain of evidence. Participants with normal glucose tolerance but a one-hour blood glucose level of 155 mg/dL or higher showed lower insulin sensitivity and a reduction in first-phase insulin secretion assessed via intravenous test, after adjustment for age, sex, and body mass index. The disposition index was also lower [2]. This study does not use CGM or a mixed meal, but it confirms with more direct physiological techniques that an early alteration in the glucose curve can be accompanied by defects in both the insulin response and insulin sensitivity.In a Korean population, 149 people with normal glucose tolerance and low one-hour glycemia were compared with 43 people who were also normotolerant but had high one-hour glycemia, and with 52 people with impaired glucose tolerance. Insulin sensitivity was similar in the two normotolerant groups, while beta-cell function indices adjusted for insulin sensitivity were lower in the group with high one-hour glycemia. The oral disposition index was 3.5 ± 4.2 in the low one-hour group and 1.8 ± 1.4 in the high one-hour group; the ISSI-2, another integrated index of secretion and sensitivity, was 301.2 ± 113.7 and 213.2 ± 67.3, respectively, with $P < 0.001$ for the overall comparison [3]. The result independently supports the narrative that a greater early excursion may signal reduced beta-cell function, even when fasting and two-hour glycemia levels still allow for a classification of normal tolerance.

7. CONFLICTING EVIDENCE

Available evidence does not indicate that the insulin response is the only possible explanation for an early elevated glycemic curve. In a physiological study of 23 adults without diabetes, the rate of appearance of ingested glucose in the blood, which depends on intestinal absorption and splanchnic processes, contributed independently to both one-hour glycemia and the first-hour incremental excursion. In multivariate models, the partial contribution of absorption was 26% for one-hour glycemia and 48% for the first-hour iAUC; both results were statistically significant [4].This finding does not contradict the fact that insulin secretion and insulin sensitivity are important. However, it scales back an exclusive interpretation of the glycemic curve as an indicator of pancreatic function alone. Furthermore, participants with elevated one-hour glycemia were older and more frequently had impaired glucose tolerance; the small sample size makes generalization cautious. Overall, the post-meal curve appears to be an integrated measure of multiple processes: glucose absorption, insulin response, peripheral glucose utilization, and regulation of hepatic production.

8. QUADRO COMPARATIVO E SINTESI DELLE EVIDENZE

The table distinguishes the study that is the subject of the review from the independent publications used to confirm or define the book's narrative.

Quadro comparativo

Reference	Study type	Population or model	Main result	Direction of evidence	Strength of evidence
Original study	Cross-sectional with CGM	100 people with type 2 diabetes; plasma measurements in 50	The profile with higher peaks and slower normalization coincided with lower insulin secretion and greater insulin resistance.	biologically consistent evidence	moderate
[1]	Cross-sectional physiological observational	113 overweight or obese adolescents without diabetes	One-hour glycemia ≥155 mg/dL associated with lower disposition index.	indirect confirmation	moderate
[2]	Cross-sectional physiological observational	305 non-diabetic adults, offspring of people with type 2 diabetes	Elevated one-hour glycemia associated with lower insulin sensitivity and reduced first-phase secretion.	direct confirmation	moderate
[3]	Cross-sectional observational	244 Korean adults with normal or impaired glucose tolerance	Elevated one-hour glycemia associated with lower beta-cell function adjusted for insulin sensitivity.	direct confirmation	moderate
[4]	Cross-sectional physiological study with dual tracer	23 adults without diabetes	Glucose absorption contributed independently to glycemia and the first-hour excursion.	discordant evidence	preliminary

9. SINTESI EDITORIALE E CONCLUSIONI

CONCLUSIONS

The study analyzed suggests that post-meal glycemic curves are not merely numerical records, but may be accompanied by differences in insulin secretion and insulin sensitivity. This point is moderately supported by independent evidence obtained primarily through oral glucose tolerance tests and physiological assessments. It remains necessary to validate these profiles in larger prospective studies using realistic meals, repeated measurements, and evaluations of clinical outcomes. At present, the idea of using such curves for personalized therapeutic strategies is promising but requires validation.

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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