LIFE Science Hub
JOURNAL OF SCIENCE
EXPANDING KNOWLEDGE ABOUT NUTRITION AND HEALTH

ORIGINAL RESEARCH
ISSN 2845-7501

The simultaneous intake of caffeinated coffee and sleep deprivation alters glucose homeostasis in Iranian men: a randomized crossover study - Evidence review

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ONLINE ARTICLE

ARTICLE INFORMATION

Published: November 23, 2026
Updated: November 23, 2026

DOI 10.5281/zenodo.24469963

1. ABSTRACT

The original study examined whether caffeinated coffee, consumed during three nights of restricted sleep, could modify glucose regulation in 42 healthy Iranian men. The crossover design, in which the same participants undergo different treatments at distinct times, is suitable for comparing acute effects. However, the available material contains only a portion of the abstract and does not allow for the reporting of all quantitative results or complete analyses.The research contributes to the passage from “The Choice to Live in Health or Illness” by Dr. A. Colonnese and R. Panzironi, according to which, in sleep-deprived individuals, caffeine can increase post-glucose glycemia, insulin, and HOMA-IR, an indirect index of insulin resistance. Independent studies confirm that acute caffeine intake can reduce insulin sensitivity and worsen the glycemic response, even after a fragmented night's sleep. Conversely, a small study during prolonged wakefulness did not detect a further increase in the glycemic area attributable to caffeine. Overall, the narrative is moderately supported for acute effects, but requires confirmation under more comparable sleep deprivation conditions and in larger populations.

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 the consumption of caffeinated coffee, in the presence of sleep deprivation, alters how the body manages glucose compared to boiled water or decaffeinated coffee. The hypothesis was, therefore, that the combination of insufficient sleep and caffeine would produce a worsening of glycemic regulation compared to conditions without caffeine.The topic is relevant to the book's section because it concerns a specific part of the narrative: after reduced sleep, caffeine exposure could be associated with higher blood glucose after a glucose load, increased insulin secretion, and a higher HOMA-IR. HOMA-IR is a calculation based on fasting glucose and insulin, used as an indirect indicator of reduced insulin sensitivity. The study can evaluate short-term changes under the experimental conditions adopted; it cannot prove that coffee causes diabetes, chronic insulin resistance, or long-term clinical consequences.

3. MATERIALS AND METHODS OF THE ORIGINAL STUDY

The available material describes a randomized crossover trial conducted on 42 healthy Iranian men, aged between 20 and 40. The participants were moderate coffee consumers. The protocol involved three treatments, separated by two-week washout periods, which are intervals intended to reduce the influence of the previous treatment.The available text indicates that each treatment included three nights of restricted sleep, with four hours spent in bed. Since the provided abstract cuts off during the description of the participants, the full details of the administered beverages, blinding procedures, glucose and insulin measurements, endpoints, statistical analysis, and exclusion criteria are not reported in the available material. Furthermore, any dropouts, adherence to the protocol, or anthropometric characteristics of the participants are not reported in the available material.

4. RESULTS

The title of the publication indicates that the simultaneous intake of caffeine from coffee and sleep deprivation altered glucose homeostasis, i.e., the balance with which the body maintains blood glucose within physiological values. However, the provided text alone cuts off before the results section. Consequently, absolute values, differences between treatments, confidence intervals, P-values, and complete results regarding post-load glucose, insulin, or HOMA-IR are not reported in the available material.The book excerpt attributes to the study the observation of a further increase in postprandial glycemia, insulin secretion, and HOMA-IR in sleep-deprived subjects who received caffeine. This is the specific narrative correspondence for which the research was cited. Since such numerical data do not appear in the available material, it is not possible to verify their magnitude, statistical precision, or exact comparison with the other treatments here.

5. INTERPRETATION

In simple terms, if blood glucose levels rise more than usual after one or more nights of insufficient sleep, and the body must produce more insulin to manage it, this may indicate a temporarily less efficient metabolic response. A higher HOMA-IR points in the same direction, but it remains an indirect indicator and is not equivalent to a clinical diagnosis of insulin resistance.The relevant segment of the chain is: sleep deprivation plus caffeine from coffee poorer glucose control after a glucose load and a greater insulin response. The crossover design makes it less likely that stable differences between individuals alone explain the comparison. Important limitations remain: the sample was small, consisting only of young, healthy men, and the available material does not allow for a full assessment of the results, possible sequence effects, and the adequacy of the analyses. The study does not directly demonstrate the molecular mechanisms mentioned in the chapter, such as alterations in the PI3K/AKT pathway or GLUT4 transporters.

6. INDEPENDENT CONFIRMING EVIDENCE

Confirmation of the passage regarding reduced insulin sensitivity comes from a randomized crossover study in 12 healthy volunteers. Intravenous caffeine reduced insulin sensitivity by 15% as measured by the euglycemic-hyperinsulinemic clamp, a technique that assesses how much glucose the body can utilize under a controlled amount of insulin. Compared to the placebo, adrenaline and free fatty acids also increased. The result confirms an acute effect of caffeine on the

insulin response in humans, but did not include sleep deprivation or orally ingested coffee [1].The study closest to the book's narrative involved 29 young adults in a crossover design. After a night with hourly five-minute awakenings, fragmented sleep alone did not increase glucose or insulin spikes during the oral glucose tolerance test. Morning intake of black coffee with approximately 300 mg of caffeine, 30 minutes before the test, instead increased the glucose peak to 8.96 mmol/L compared to 8.23 mmol/L after fragmented sleep without coffee, and increased the insulin peak to 310 pmol/L compared to 235 pmol/L. The incremental glucose increase was also greater compared to fragmented sleep without coffee. This directly confirms the direction of the effect described in the book, although it studied sleep fragmentation for only one night and not three nights with four hours in bed [2].A systematic review with meta-analysis of seven randomized trials, totaling 70 healthy participants, found that acute caffeine ingestion reduced the insulin sensitivity index compared to placebo. The combined effect was a standardized mean difference of –2.06, with a 95% confidence interval from –2.67 to –1.44; heterogeneity was moderate, with an I^2 of 49%. The meta-analysis reinforces the consistency of the signal for acute caffeine, but does not verify the specific interaction with sleep deprivation [3].

7. CONFLICTING EVIDENCE

A small double-blind laboratory study examined 17 young adults during 50 hours of continuous wakefulness. Participants received four nighttime doses of 200 mg of caffeine or a placebo; meals were controlled. After two nights of sleep deprivation, the glycemic response to breakfast increased compared to baseline, but caffeine did not alter the area under the glucose curve compared to the placebo, with P=0.680. In other words, sleep loss worsened the glycemic response, but in this protocol, caffeine did not produce a further measurable worsening [4].This evidence does not negate the signal observed in studies using glucose tolerance tests and morning coffee. The protocols differed in the number of participants, duration of wakefulness, formulation and amount of caffeine, timing of intake, method of glucose detection, and the outcome analyzed. However, it shows that the combined effect is not constant across all experimental conditions and that dose, timing, and sleep patterns can modify the result.

8. QUADRO COMPARATIVO E SINTESI DELLE EVIDENZE

The table distinguishes the study under 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	Randomized crossover trial	42 healthy Iranian men, 20-40 years old, subjected to three nights of sleep restriction	The available material does not report complete quantitative results; the book chapter reports increases in post-load glycemia, insulin, and HOMA-IR with caffeine.	biologically consistent evidence	preliminary
[1]	Double-blind crossover RCT	12 healthy volunteers	Caffeine reduced insulin sensitivity by 15% compared to placebo.	indirect confirmation	moderate
[2]	Crossover RCT	29 healthy young adults	After fragmented sleep, coffee with approximately 300 mg of caffeine increased glucose and insulin spikes during OGTT.	direct confirmation	moderate
[3]	Systematic review and meta-analysis of RCTs	70 healthy participants in 7 trials	Acute caffeine intake reduced insulin sensitivity compared to placebo.	indirect confirmation	moderate
[4]	Double-blind experimental study	17 young adults during 50 hours of continuous wakefulness	Caffeine did not increase the post-breakfast glycemic area compared to placebo, despite the increase linked to prolonged wakefulness.	discordant evidence	low

9. SINTESI EDITORIALE E CONCLUSIONI

CONCLUSIONS

The analyzed publication is consistent with the section of the book dedicated to the potential deterioration of glucose homeostasis when caffeine and insufficient sleep occur together. However, the available material does not allow for direct verification of all quantitative results from the original study.Independent evidence reasonably supports the fact that acute caffeine intake can reduce insulin sensitivity and increase glucose and insulin levels following a glucose tolerance test, even after fragmented sleep. However, the combined effect does not appear uniform across every sleep deprivation model. The narrative is moderately supported regarding acute effects and requires validation in larger studies, involving both men and women, different consumption habits, and repeated metabolic measurements.

Aggiornato al 24/11/2026. 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

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