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

ORIGINAL RESEARCH
ISSN 2845-7501

A systematic review of beta-cell function in Black African adults - Evidence review

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1. ABSTRACT

The analyzed study reviewed 41 research papers comparing pancreatic beta-cell function in adults of Black African descent and White Europeans. The main finding is that higher peripheral insulin concentrations do not necessarily equate to greater pancreatic secretion: they may also depend on lower clearance, i.e., the elimination of the hormone, primarily by the liver.This distinction contributes to the passage from "The Choice to Live in Health or Illness" by Dr. A. Colonnese and R. Panzironi, dedicated to insulin clearance and the metabolic differences observed between populations. Independent studies, conducted on people of West African, African American, and Black African ancestry, repeatedly confirm lower hepatic insulin extraction. However, not all studies attribute this difference to ethnicity independently: adiposity, insulin sensitivity, sex, glycemic status, and measurement methods can alter its interpretation. The narrative is therefore well-supported as a comparative physiological phenomenon, but it does not demonstrate a single cause nor does it allow for predictions for every individual.

ONLINE ARTICLE

ARTICLE INFORMATION

Published: November 18, 2026
Updated: November 18, 2026

DOI 10.5281/zenodo.24338209

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 function of pancreatic beta cells, the cells that produce insulin, differs in Black African adults compared to White European adults across all glucose tolerance conditions. The hypothesis to be tested was widespread but not uniformly proven: that higher insulin levels in peripheral blood in Black African populations might reflect greater secretory activity of beta cells.The publication is relevant to section 3.3 of "The Choice to Live in Health or Illness" by Dr. A. Colonnese and R. Panzironi because it clarifies an essential point: the insulin measured in the blood is the result of both how much the pancreas secretes and how much the liver removes during the first pass. C-peptide, which is secreted by the pancreas along with insulin but extracted to a negligible extent by the liver, allows for a better distinction between these two processes.As a qualitative systematic review, the analyzed study can summarize the direction of published results and highlight recurring methodological limitations. However, it cannot establish that a characteristic attributed to an ethnic group is genetically determined, nor can it prove that lower clearance causes type 2 diabetes.

3. MATERIALS AND METHODS OF THE ORIGINAL STUDY

The authors conducted a systematic review according to the PRISMA framework, a set of criteria used to ensure transparency in the selection of studies. The bibliographic search was performed in the Ovid Medline database in June 2018. Comparative studies on adults aged over 18, of indigenous Black African or diaspora origin, and white European adults were included.Individuals with normal glucose tolerance, impaired fasting glycemia, impaired glucose tolerance, or type 2 diabetes were eligible. The studies had to evaluate beta-cell function in vivo, i.e., in the living organism, using tests based on oral glucose, mixed meal, intravenous glucose, arginine, or indices calculated from glycemia, insulin, and C-peptide. Pediatric studies, studies lacking a direct statistical comparison with the white European population, and works that measured only fasting insulin or C-peptide without model-based assessment were excluded.Two researchers independently selected the articles. When multiple publications derived from the same research, the one with the largest number of participants was included. The risk of bias was estimated using a modified version of the Newcastle-Ottawa scale for cross-sectional studies, i.e., studies that observe participants at a single point in time and do not follow them over time.

4. RESULTS

Out of 182 articles reviewed, 41 were included in the qualitative synthesis. A total of 4,619 people of Black African descent were considered. Thirty studies involved African American populations; five involved indigenous Black African populations; two involved immigrants from Africa; and three involved Afro-Caribbean populations in the United Kingdom. Most of the studies included people without diabetes or with normal glucose tolerance, while only three studies exclusively involved people with impaired glycemia or reduced glucose tolerance, and three exclusively involved people with type 2 diabetes.Thirty-four out of 41 studies reported a greater peripheral insulin response in people of Black African descent compared to white Europeans. This observation describes more insulin in the general circulation after a stimulus, but it does not in itself identify whether the increase stems from the pancreas or from reduced hepatic clearance. In the 14 studies that adjusted for adiposity, hyperinsulinemia—that is, higher insulin levels—persisted. In the 15 studies that adjusted for insulin sensitivity, the difference persisted in the majority, while two studies interpreted it as a compensatory response to lower sensitivity to the hormone.The results were more consistent following intravenous glucose: 23 of the 25 available studies reported a greater insulin response in the Black African group. Conversely, among the 21 studies based on oral glucose or a meal, ten found no differences, seven reported a greater insulin response, and two reported a lower response. The few studies involving a mixed meal did not find significant differences in the incremental insulin area.The most relevant section of the book concerns the 14 studies that measured C-peptide. In participants with normal glucose tolerance, the results regarding pancreatic insulin secretion were inconsistent: four studies showed greater secretion, two showed lower, and others showed no significant difference. In the three small

studies including only people with impaired glucose regulation or type 2 diabetes, for a total of 170 Black African participants, the secretion estimated by C-peptide was consistently lower compared to white Europeans. The authors therefore concluded that peripheral hyperinsulinemia does not consistently demonstrate increased beta-cell function in adults.

5. INTERPRETATION

In simple terms, the insulin that reaches the muscle and adipose tissue does not just reflect how hard the pancreas is working. It first passes through the liver, which removes a significant portion of it. If the liver extracts less, circulating insulin can increase even without higher pancreatic secretion.The segment documented by the publication subject to the Evidence Review therefore indicates that: higher peripheral insulin observed in Black African populations does not automatically imply greater beta-cell secretion, because lower hepatic insulin extraction can contribute substantially to the result. C-peptide is important precisely because, being eliminated by the liver to a much lesser extent than insulin, it offers a closer estimate of pancreatic secretion.This interpretation supports the book's reasoning on clearance as a determinant of tissue exposure to insulin. However, it does not prove that reduced clearance always precedes insulin resistance, nor that it alone explains the higher risk of type 2 diabetes in all populations of African descent. The groups studied were heterogeneous in terms of geographical origin, sex, body composition, glycemic status, and tests used; furthermore, the majority of participants were women without diabetes.

6. INDEPENDENT CONFIRMING EVIDENCE

Direct confirmation comes from a comparative study conducted in adults with normal glucose tolerance belonging to three populations of West African ancestry: Ghanaians living in Ghana, Ghanaian immigrants, and African Americans, compared with white Americans. After a 75 g oral glucose load, the three West African ancestry groups showed higher insulin concentrations and incremental responses, with no significant differences in the corresponding C-peptide concentrations. Hepatic extraction and insulin clearance were reduced by 25% to 52% compared to the white group. The result therefore directly links higher peripheral insulin to lower hormone elimination, rather than just to presumed hypersecretion. However, the cross-sectional design and indirect estimation of clearance limit any causal conclusions [1].A second study used a mathematical model to separate hepatic from extrahepatic clearance in 47 healthy women, 18 African American and 29 European American. In the first 20 minutes of an intravenous glucose test, the area under the insulin curve was approximately double in the African American participants, 215 versus 102 pmol/L × hour, with P=0.0015. The model indicated that the difference was attributable to lower liver extraction: 85% of the insulin directed to the liver escaped degradation in the African American group, compared to 55% in the European American group. Extrahepatic clearance was not significantly reduced. This confirms the central physiological step of the narrative: it is primarily the liver that contributes to the observed difference in peripheral insulin [2].In black African and white European men, with normal glucose tolerance or early type 2 diabetes, a further study used a mixed meal, C-peptide modeling, hyperinsulinemic-euglycemic clamp to measure insulin sensitivity, and magnetic resonance imaging for visceral fat. The 81 participants included 40 black African men and 41 white European men. Insulin clearance was significantly lower in the black African group, with P=0.011, despite insulin sensitivity showing no significant ethnic differences. In the multivariate model, ethnicity, insulin sensitivity, and adiponectin were independent predictors of clearance; the adjusted mean difference between white Europeans and black Africans was 96 mL/m² of body surface area per minute. This study reinforces the idea that reduced clearance is not necessarily explained solely by adiposity or insulin resistance, although it remains observational and limited to men [3].Taken together, these independent pieces of evidence convergently confirm the specific part of the chain discussed in the book: higher insulin in peripheral blood can coexist with non-increased pancreatic secretion because the liver extracts less insulin. They do not, however, demonstrate that this characteristic has the same magnitude in all people classified within broad ethnic categories, nor that it inevitably leads to diabetes.

7. CONFLICTING EVIDENCE

An analysis of 1,295 participants from the Insulin Resistance Atherosclerosis Study confirmed that metabolic insulin clearance was lower in African Americans and Hispanic Americans compared to non-Hispanic whites. However, after accounting for adiposity, insulin sensitivity, and acute insulin response, the differences in clearance associated with ethnic group and glycemic status were largely explained by these factors. In this context, lower clearance appears primarily related to concomitant metabolic changes, rather than being an independent ethnic determinant [4].This evidence does not deny the phenomenon of lower clearance observed in many populations, but it narrows its interpretation. The differences depend on the type of test: this analysis estimated metabolic clearance using intravenous glucose, while other studies specifically reconstructed the hepatic fraction using C-peptide and physiological models. Furthermore, sex, adiposity, and glycemic condition were more variable. No sufficiently relevant directly conflicting evidence has been identified regarding the possibility that reduced hepatic extraction contributes to hyperinsulinemia; this does not prove the absence of contrary results.

8. QUADRO COMPARATIVO E SINTESI DELLE EVIDENZE

The table distinguishes the review that is the subject of the article from the independent research used to evaluate the book's passage on insulin clearance.

Quadro comparativo

Reference	Study type	Population or model	Main result	Direction of evidence	Strength of evidence
Original study	Qualitative systematic review	41 studies; 4,619 Black African adults in total	Peripheral insulin was often higher, but C-peptide data did not consistently confirm greater beta-cell secretion.	biologically consistent evidence	moderate
[1]	Comparative cross-sectional observational	Ghanaian adults, Ghanaian immigrants, African Americans, and White Americans with normal glucose tolerance	Higher insulin, similar C-peptide, and 25%-52% reduced hepatic clearance/extraction in groups of West African ancestry.	direct confirmation	moderate
[2]	Physiological observational with modeling	47 healthy women: 18 African American and 29 European American	Lower clearance was attributed to the hepatic component; extrahepatic clearance did not differ significantly.	direct confirmation	moderate
[3]	Cross-sectional observational with mixed meal, C-peptide modeling, and clamp	81 men: 40 Black African and 41 White European, with normal glucose tolerance or early diabetes	Significantly lower insulin clearance in Black African men, even after adjustment for selected metabolic variables.	direct confirmation	moderate

[4]	Multicenter cross-sectional observational	1,295 African American, Hispanic American, and non-Hispanic White participants	Clearance was lower in African Americans, but the differences were largely explained by adiposity, sensitivity, and insulin secretion.	discordant evidence	moderate

9. SINTESI EDITORIALE E CONCLUSIONI

CONCLUSIONS

The analyzed publication appropriately supports the section of the book dedicated to insulin clearance. Its most important conclusion is not that the beta cells of black African adults always produce more insulin, but that higher circulating insulin may also depend on reduced hepatic clearance.Independent evidence confirms this mechanism quite well in human studies that have used C-peptide and clearance modeling. However, the reason for the difference, the relative weight of adiposity and insulin sensitivity, and its individual prognostic significance remain less defined. The narrative is therefore well-supported physiologically, while the causal implications for insulin resistance and diabetes require further longitudinal studies representative of both sexes.

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.

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