

Salivary 1,5-Anhydroglucitol in Type 2 Diabetes: Evidence, Assay Barriers, and Point-of-Care Readiness

Andrea Basualdo Allende

andreasbasualdos@gmail.com

Sarah Sadat Ehsani

University of Louisville School of Dentistry

Pascal Eber

Medical School Hannover

Mohadeseh Alimohammadi

Tehran Medical Sciences, Islamic Azad University

Alexander Ariel Padron Gonzalez

Metropolis Pharma

Rudi Schmidt

Amanahyat Institute Abu Dhabi

Systematic Review

Keywords: 1,5-anhydroglucitol, type 2 diabetes mellitus, saliva, point-of-care testing, diabetes screening, oral-systemic health

Posted Date: October 20th, 2026

DOI: <https://doi.org/10.21203/rs.3.rs-11225052/v1>

License:   This work is licensed under a Creative Commons Attribution 4.0 International License. [Read Full License](#)

Additional Declarations: No competing interests reported.

Abstract

Objectives

Type 2 diabetes mellitus (T2DM) remains substantially underdiagnosed, while established glycemic tests may not fully capture short-term glycemic excursions. This review evaluates salivary 1,5-anhydroglucitol (1,5-AG) as a noninvasive adjunctive marker of recent glycemic dysregulation in T2DM and examines barriers to point-of-care translation.

Materials and Methods

A narrative review with a structured literature search and evidence-mapping approach was conducted. A two-stage search identified direct clinical studies of salivary 1,5-AG in T2DM and salivary biosensing studies relevant to future point-of-care development.

Results

Eight primary studies were included: four directly evaluated salivary 1,5-AG and four examined salivary biosensing approaches relevant to translation. Salivary 1,5-AG was generally lower with poorer glycemic status, although reported thresholds and performance varied across studies. Evidence was limited by small samples, observational designs, heterogeneous saliva collection, assay variability, and incomplete reporting of confounders. Biosensor studies supported the feasibility of saliva-compatible point-of-care formats, but none directly evaluated salivary 1,5-AG. No salivary 1,5-AG assay validated for routine clinical use or clinically implemented salivary point-of-care device was identified.

Conclusions

Salivary 1,5-AG shows promise as a noninvasive adjunctive marker of recent glycemic dysregulation, but current evidence remains insufficient for routine clinical adoption. Its most plausible future role is case-finding or triage in accessible healthcare settings, followed by confirmatory blood-based testing. Standardized sampling, saliva-specific analytical validation, and prospective multisite evaluation are still required.

Clinical Relevance

If validated, salivary 1,5-AG could provide a noninvasive means of identifying patients who may warrant further glycemic assessment during dental or other accessible healthcare encounters, creating a practical opportunity to strengthen medical-dental integration.

1. Introduction

Type 2 diabetes mellitus (T2DM) is a major non-communicable disease characterized by insulin resistance and insufficient insulin production, leading to dysregulated blood-glucose control [1]. Despite expanding diagnostic capacity, approximately 43% of adults living with diabetes remain undiagnosed worldwide, and the number of affected adults is projected to rise to 853 million by 2050 [2]. Global pooled analyses also document a substantial rise in diabetes prevalence through 2022 [3]. Delayed diagnosis and suboptimal monitoring contribute to preventable complications and excess mortality, with disproportionate impact in low- and middle-income countries where access to testing and follow-up often falls short of need [1, 2]. In routine care, glycemic status is commonly assessed using venous blood glucose and glycated hemoglobin (HbA1c), supplemented by capillary blood glucose monitoring and, increasingly, continuous glucose monitoring (CGM) where available [4]. However, established laboratory markers may not fully capture short-term glycemic excursions and can be difficult to interpret in clinical contexts that influence HbA1c [4–6]. These gaps motivate interest in complementary biomarkers that better reflect recent hyperglycemia and can be measured using more accessible, patient-acceptable sampling approaches.

Saliva is a noninvasive, cost-effective biofluid that can reflect systemic physiology and supports point-of-care testing without venipuncture [7–9]. Given the bidirectional relationship between T2DM and periodontal health, in which hyperglycemia increases periodontal susceptibility while periodontal inflammation may adversely influence metabolic control, saliva-based strategies may help bridge currently siloed care by complementing contemporary diagnostic and monitoring tools and enabling more integrated medical-dental workflows [9–12].

1,5-Anhydroglucitol (1,5-AG) is a dietary polyol that circulates at relatively stable concentrations under normal conditions [6, 13]. Its circulating levels are influenced by intestinal and renal handling, with renal reabsorption playing a major role in maintaining systemic concentrations [6, 13, 15]. Genetic variation also contributes to inter-individual differences in circulating 1,5-AG [14]. During hyperglycemia, glucosuria competitively reduces renal reabsorption of 1,5-AG, increasing its urinary loss and lowering its circulating concentration [5, 6, 15]. Consequently, 1,5-AG decreases in response to short-term glucose excursions, particularly postprandial peaks, and generally reflects glycemic exposure over approximately one to two weeks [5, 6]. This mechanism underlies its role as a marker of recent hyperglycemic excursions. Cellular studies further indicate that 1,5-AG is minimally metabolized, although its possible direct metabolic effects remain uncertain [13].

This narrative review, using a structured literature search and evidence-mapping approach, evaluates the current evidence for salivary 1,5-AG in T2DM, with particular emphasis on its relationship to glycemic status, its potential adjunctive case-finding or triage role, and the barriers that must be addressed before point-of-care implementation. Emerging saliva-compatible point-of-care platforms and early 1,5-AG biosensing concepts further support interest in the potential translation of this biomarker beyond laboratory-based measurement [16, 17]. This question is particularly relevant because dental and community settings may provide additional opportunities for identifying individuals who warrant confirmatory medical testing, provided that saliva-specific analytical and validation barriers can be overcome.

2. Methods

The review followed a structured search and synthesis approach, and findings were synthesized narratively according to clinical use case and translational readiness.

A two-stage literature search was used. First, an exploratory landscape scan (PubMed/MEDLINE, Embase, and Cochrane Library; January 2020 to November 2024) was performed to identify salivary biomarkers proposed for early T2DM; based on biological plausibility and translational feasibility, 1,5-AG was selected for focused synthesis. Because this exploratory nomination process was not a systematic comparative evaluation of candidate salivary biomarkers, biomarker selection may be subject to selection bias and cannot establish that 1,5-AG is preferable to alternative salivary biomarkers.

Second, a targeted search (PubMed, Google Scholar, and citation chasing; January 1, 2014–September 23, 2026) was conducted to identify studies on 1,5-AG in T2DM and saliva-based biosensing, point-of-care testing (POCT), or wearable approaches relevant to diagnosis, screening, or monitoring. Contextual references used to support the Introduction and Discussion were also updated through September 23, 2026, but were not part of the eligibility-based primary-study selection. Search terms and strategies are provided in Supplementary Appendix S1. The focused second-stage literature-identification and selection process is summarized in Fig. 1.

Records were de-duplicated and assessed in two stages (title/abstract followed by full-text assessment) against the eligibility criteria. Two reviewers independently evaluated records at each stage, with disagreements resolved through discussion. Peer-reviewed primary studies published in English from January 1, 2014 to September 23, 2026 were eligible if they met either of the following criteria: (1) clinical studies evaluating salivary 1,5-AG in adult populations for T2DM screening, case-finding, diagnostic discrimination, or clinically oriented glycemic monitoring; or (2) original saliva-based biosensor, point-of-care testing, or wearable studies relevant to T2DM diagnosis, screening, or monitoring that reported performance data or primary feasibility outcomes. Studies were excluded if they were secondary literature, including reviews or bibliometric analyses; conference abstracts; editorials, commentaries, or letters without primary data; grey literature or preprints; focused on type 1 diabetes mellitus; included gestational-only cohorts without separately extractable T2DM data; or included mixed diabetes populations without extractable T2DM-specific results. For the direct clinical salivary 1,5-AG evidence stream, non-human studies were excluded. Studies focused primarily on mechanistic or physiological associations without clinically evaluable screening, diagnostic, case-finding, or monitoring outcomes were also excluded from the primary evidence synthesis. Analytical-method studies without clinically evaluable biomarker-performance outcomes were used as contextual evidence but were not counted among the eligible primary clinical studies. Studies specifically involving populations with periodontitis or in which periodontitis was a defining study condition were excluded to reduce potential oral-inflammatory confounding of salivary biomarker measurements and to better isolate the T2DM-related salivary 1,5-AG signal. This criterion was not intended to imply that 1,5-AG is an established biomarker of periodontitis, but rather to minimize the possibility that concurrent periodontal inflammation influenced the salivary metabolomic profile.

Findings were synthesized narratively according to clinical use case and translational readiness.

Data were summarized in two structured evidence tables: (1) a clinical evidence table describing study design, saliva collection and assay approach, clinical signal, screening/triage performance, and qualitative translational readiness; and (2) a biosensor table summarizing target and sensor format, saliva workflow and readiness, and relevance to future 1,5-AG translation. Items not reported in the source publications were coded as “not reported.”

For Table 1, translational readiness was assessed qualitatively across three domains: clinical signal, sampling stability, and chairside feasibility. Clinical signal was rated as supported (+) when the study demonstrated a clear association with glycemic status or clinically relevant discrimination; partial (+/–) when the direction of association was supportive but quantitative performance or validation was limited; and not supported/unclear (–) when clinically relevant association or discrimination was not demonstrated. Sampling stability was rated as supported (+) when saliva collection and pre-analytical procedures were clearly standardized and adequately described; partial (+/–) when collection was described but important pre-analytical uncertainties remained; and not supported/unclear (–) when sampling procedures were insufficiently characterized or major unresolved matrix or collection issues were present. Chairside feasibility was rated as supported (+) when near-patient use without specialized laboratory infrastructure was demonstrated; partial (+/–) when the approach showed potential for decentralized use but still required substantial processing or laboratory equipment; and not supported/unclear (–) when testing depended on specialized laboratory methods or chairside use had not been demonstrated. These ratings were descriptive and were not based on a validated scoring system. Ratings were independently reviewed by two authors, with disagreements resolved by consensus. No formal risk-of-bias or methodological quality scoring tool was applied; study limitations were summarized narratively at the individual-study and synthesis levels.

3. Results

3.1 Study selection

Across search sources, 273 records were identified. After removal of 30 duplicates, 243 records underwent title and abstract screening. Thirty-three full-text articles were assessed for eligibility, of which 26 were excluded. Seven studies were retained from the database search, and one additional eligible study was identified through manual searching, resulting in eight primary studies included in the narrative synthesis (Fig. 1).

Note

Records were identified through database and manual searching, screened according to the eligibility criteria, and retained for narrative synthesis. The diagram follows the general structure of the PRISMA 2020 flow diagram but does not represent a formal PRISMA systematic review.

3.2 Direct clinical evidence on salivary 1,5-AG in T2DM

Across the primary clinical studies in Table 1, salivary 1,5-AG generally served as a blood-derived marker expressed in saliva, showing lower levels with poorer glycemic status and correlations consistent with short-

term glycemia [18–21]. The earliest study reported strong concordance between salivary and circulating 1,5-AG and inverse relationships with glucose/HbA1c, findings consistent with the interpretation that salivary 1,5-AG largely reflects systemic levels and glucosuria-related physiology [19].

Jian et al. [18] used a laboratory mass-spectrometry method to evaluate salivary 1,5-anhydroglucitol as a screening aid. They proposed an approximate cut-off of 0.44 µg/mL. On its own, this threshold showed only moderate ability to classify T2DM status, but accuracy improved when salivary 1,5-anhydroglucitol was combined with fasting blood glucose or HbA1c. The authors suggested that this combined approach could reduce the number of people needing an oral glucose tolerance test.

Smaller case-control studies reported lower salivary and blood levels of 1,5-AG in adults with T2DM than in controls, but did not report diagnostic accuracy metrics, such as the area under the receiver operating characteristic curve (AUC), sensitivity, or specificity [20]. Kedarnath and colleagues reported high sensitivity and specificity for identifying marked post-meal hyperglycemia using a low salivary 1,5-AG threshold, although the sample was small and skewed toward very high glucose levels [21].

Overall, evidence is limited by cross-sectional and case-control designs, single-center sampling, and heterogeneous pre-analytics/assays, with incomplete reporting of oral/periodontal status in some studies. Table 1 summarizes the key clinical studies evaluating salivary 1,5-AG in relation to glycemic status and screening/triage performance and provides an at-a-glance assessment of translational readiness across three domains (clinical signal, sampling stability, and feasibility for chairside use).

Table 1
Salivary 1,5-AG in type 2 diabetes: evidence snapshot and readiness for translation

Mook-Kanamori (2014) [19]	
Country/setting	Germany/Qatar
Study type	Case-control study
Saliva sampling	Non-fasting saliva; swab collection.
Key clinical signal	Saliva 1,5-AG tracked blood 1,5-AG; inverse with blood glucose and glycated hemoglobin; low values linked with glucosuria.
Screening/triage signal	Not designed as screening test. No cut-off reported.
Readiness at a glance	Signal: (+) Sampling: (+/-) Chairside: (-)
What is missing to implement	Not implementation-tested. Collection device effects; sampling needs standardization. Prospective validation needed.
Jian (2020) [18]	
Country/setting	China
Study type	Population-based cross-sectional
Saliva sampling	Fasting and 2-hour post-load; swab collection; laboratory mass spectrometry.
Key clinical signal	Lower in diabetes; contributed to screening/triage models and improved detection when combined with fasting glucose or glycated hemoglobin.
Screening/triage signal	Cut-off ~ 0.44 µg/mL. Moderate discrimination: model reduced oral glucose tolerance testing in that cohort.
Readiness at a glance	Signal: (+) Sampling: (+/-) Chairside: (-)
What is missing to implement	Single center; groups enriched for high-risk. Resource-intensive laboratory method. No head-to-head simple enzymatic saliva test.
Asha (2019) [20]	
Country/setting	India
Study type	Case-control
Saliva sampling	Non-fasting unstimulated saliva (spitting); laboratory mass spectrometry.
Note: Signal, sampling, and chairside readiness were rated according to the qualitative operational criteria described in the Methods. Symbols indicate supported (+), partial/moderate support (+/-), and not supported or unclear (-).	

Mook-Kanamori (2014) [19]	
Key clinical signal	Salivary (and blood) 1,5-AG lower in diabetes vs controls.
Screening/triage signal	No thresholds or diagnostic accuracy metrics reported.
Readiness at a glance	Signal: (+/-) Sampling: (+/-) Chairside: (-)
What is missing to implement	Small, single site. No diagnostic thresholds. Needs larger studies (fasting vs non-fasting stratification).
Kedarnath (2023) [21]	
Country/setting	India
Study type	Diagnostic validation
Saliva sampling	Unstimulated saliva (spitting); high-sensitivity laboratory method with interference-reduction steps.
Key clinical signal	Predicted high post-meal blood glucose using salivary 1,5-AG.
Screening/triage signal	Cut-off < 0.054 µg/mL. Sensitivity 86.4%; specificity 87.2% for post-meal glucose > 180 mg/dL.
Readiness at a glance	Signal: (+) Sampling: (+/-) Chairside: (+/-)
What is missing to implement	Small, single center; case mix skewed. Advanced equipment limits routine use. Broader validation required.
Note: Signal, sampling, and chairside readiness were rated according to the qualitative operational criteria described in the Methods. Symbols indicate supported (+), partial/moderate support (+/-), and not supported or unclear (-).	

3.3 Indirect translational evidence from salivary biosensor platforms

The biosensor studies should not be interpreted as evidence that salivary 1,5-AG point-of-care testing is currently available; rather, they provide indirect platform evidence relevant to future assay development.

The included device studies largely targeted salivary glucose using prototypes or early translational formats, including mouthguard-based, conductivity-based, and tongue-depressor approaches [22–24].

Electrochemical sensing was the predominant strategy, with enzyme-based recognition, including glucose oxidase, used in some glucose-sensing platforms. One study extended beyond glucose to another T2DM-relevant salivary analyte, methylglyoxal, using a non-enzymatic electrochemical approach [25]. Collectively, these studies demonstrate the feasibility of saliva-compatible sensing formats but do not provide direct evidence for salivary 1,5-AG detection.

Table 2
Salivary biosensing approaches relevant to 1,5-AG translation

Study	Current target and sensor format	Saliva workflow and readiness	Relevance to salivary 1,5-AG translation
Arakawa et al. (2020) [22]	Salivary glucose; mouthguard electrochemical sensor	Tested in human saliva and in the oral cavity; saliva centrifugation was reported. Demonstrates in-mouth wearable feasibility, but workflow simplicity remains limited.	Indirect platform evidence. The mouthguard format may inform future salivary 1,5-AG sensing, but it does not measure 1,5-AG.
Lin et al. (2023) [24]	Salivary conductivity for fasting glucose screening; portable printed circuit board sensor	Rapid saliva workflow using rinsing, excess saliva removal, and short sublingual swabbing. Portable format, but not clearly wearable.	Indirect platform evidence. The simplified point-of-use workflow may be relevant to future 1,5-AG triage, but no 1,5-AG-specific detection was demonstrated.
Luo et al. (2019) [23]	Salivary glucose; tongue-depressor electrochemical sensor	Human saliva was used with buffer-based testing. Demonstrates a point-of-use oral sensor format, but not a validated clinical workflow.	Indirect platform evidence. The tongue-depressor architecture may be adaptable, but it does not measure salivary 1,5-AG.
Vasanth et al. (2024) [25]	Salivary methylglyoxal; non-enzymatic electrochemical nanohybrid electrode	Volunteer saliva was used after short pre-collection restriction. Not wearable, but relevant to non-glucose salivary analyte detection.	Indirect platform evidence. It supports feasibility of detecting a non-glucose diabetes-related analyte in saliva but does not measure 1,5-AG.

Note: These studies provide indirect platform evidence only. They demonstrate saliva-compatible sensing formats or workflows for glucose, conductivity, or methylglyoxal, but none directly measures salivary 1,5-AG or provides a validated 1,5-AG-specific saliva workflow. 1,5-AG, 1,5-anhydroglucitol.

4. Discussion

4.1 Principal findings

Overall, salivary 1,5-AG shows biological plausibility as a noninvasive marker of recent glycemic exposure, but the current evidence remains insufficient to support routine clinical case-finding or triage. Across the direct clinical studies, lower salivary 1,5-AG concentrations were generally associated with poorer glycemic status, but reported discrimination and thresholds were derived predominantly from small, single-center studies using heterogeneous sampling and analytical methods. No salivary 1,5-AG point-of-care assay validated for routine clinical use or clinically implemented device was identified. These findings position salivary 1,5-AG as a potential adjunctive signal rather than a standalone diagnostic test and highlight the need for prospective validation in real-world clinical pathways [18–21].

4.2 Pre-analytical, analytical, and biological barriers

Translation of salivary 1,5-AG is constrained by substantial pre-analytical heterogeneity. Collection method, stimulation, fasting state, sampling time, oral contamination, transport, processing, and storage may all affect analyte concentration and limit comparability across studies [9, 26–29]. Behavioral factors, including recent food or beverage intake, toothbrushing, and mouthwash use, may further introduce variability or contamination. Future validation studies should therefore predefine saliva collection and processing procedures and report these conditions in sufficient detail to support reproducibility. A proposed pre-analytical workflow is provided in Supplementary Figure S1.

Future protocols should also prespecify sample invalidation criteria, including visible blood contamination, recent food or beverage intake, recent oral-hygiene procedures, insufficient salivary volume, and acute oral inflammatory conditions where these factors could compromise analytical validity.

Analytical and biological confounding adds further complexity. Because salivary 1,5-AG concentrations are lower and more method-dependent than serum concentrations, reliable measurement requires sensitive, matrix-appropriate analytical methods. Liquid chromatography–tandem mass spectrometry (LC-MS/MS) currently provides a strong reference analytical basis, whereas enzymatic approaches require saliva-specific adaptation to address galactose-related and other matrix interferences [18, 21, 29]. Interpretation is also influenced by renal function and glycosuria, particularly in chronic kidney disease and during treatment with sodium-glucose cotransporter 2 (SGLT2) inhibitors, while age, sex, diet, ethnicity, and other clinical factors may contribute to inter-individual variability [5, 6, 15, 50]. Chronic liver disease may further reduce circulating 1,5-AG independently of glycemic control, representing an additional potential limitation to interpretation [30]. These factors complicate the establishment of universal reference ranges and reinforce the need for standardized analytical validation.

4.3 Clinical positioning relative to established glycemic markers

Clinical evidence supports circulating 1,5-AG as a complementary marker of short-term glycemic control [5, 6, 31]. Serum concentrations are reduced in T2DM and show inverse associations with fasting glucose, postprandial glucose, and HbA1c, supporting sensitivity to recent hyperglycemic excursions that may not be fully reflected by HbA1c [5, 6]. The established blood-based behavior of 1,5-AG therefore provides the biological and clinical reference against which its salivary application should be interpreted [5, 6, 29].

The potential value of 1,5-AG lies in complementing rather than replacing established glycemic markers. HbA1c reflects longer-term glycemic exposure but may not fully characterize acute or postprandial excursions, whereas 1,5-AG may provide additional information on recent hyperglycemia when interpreted alongside HbA1c and fasting glucose [5, 6, 35, 36]. Variation in serum 1,5-AG among individuals with T2DM who have reached HbA1c targets further illustrates that these markers may capture different dimensions of glycemic exposure [34]. Studies combining 1,5-AG with HbA1c or fasting glucose have reported improved diabetes-screening efficiency compared with the use of individual markers alone [35, 36]. More broadly, complementary biomarkers and glucose-monitoring metrics may be particularly useful when HbA1c alone does not adequately characterize short-term glycemic variability [4, 6]. Table 3 summarizes the major

glycemic markers relevant to interpretation of 1,5-AG and highlights their differing time windows, clinical roles, and limitations.

Table 3
Clinical characteristics of major glycemic markers relevant to interpretation of 1,5-AG

Glycemic marker	Time window	Clinical utility	Limitations	Invasiveness	Interpretation
Fasting plasma glucose (FPG)	Single time point after an overnight fast of at least 8 h [37]	Reflects current glycemic status; rapid, inexpensive, and widely available; well established for diagnosis and routine assessment. [4, 37]	Requires fasting; affected by acute illness, stress, and recent behavioral factors; reflects only a single point; may miss isolated postprandial hyperglycemia. [4, 37]	Blood-based (invasive)	High: well established diagnostic thresholds [4, 37]
HbA1c	2–3 months [4, 37]	Reflects long-term glycemic exposure; does not require fasting; low intra-individual variability; well standardized; recommended for diagnosis and monitoring; strongly associated with complications. [4, 37]	Indirect marker; affected by hemoglobin variants, anemia, hemolysis, and chronic kidney disease; limited sensitivity to short-term changes; relatively higher cost. [4, 37]	Blood-based (invasive)	High: well established cut-offs and clinical guidelines [4, 37]
Fructosamine	Approximately 2–4 weeks [37]	Reflects mean glycemia over a shorter period than HbA1c; may be useful when HbA1c interpretation is compromised by altered red blood cell turnover, hemoglobin variants, or	Clinical utility is less well established than for HbA1c; fructosamine is not standardized, and established treatment goals are lacking. [37]	Blood-based (invasive)	Adjunctive short-term glycemic marker; interpretation is limited by lack of standardization and established clinical targets. [37]

Note: Time windows are approximate and may vary according to patient characteristics, assay methodology, and clinical context. 1,5-AG, 1,5-anhydroglucitol; HbA1c, glycated hemoglobin A1c; SGLT2, sodium-glucose cotransporter 2; T2DM, type 2 diabetes mellitus.

Glycemic marker	Time window	Clinical utility	Limitations	Invasiveness	Interpretation
		other interfering factors. [37]			
Glycated albumin	Approximately 2–4 weeks [37]	Reflects glycemia over a shorter period than HbA1c; may be useful when HbA1c interpretation is compromised. [37]	Clinical utility is less well established than for HbA1c; assays are not fully standardized, and established treatment goals are lacking. [37]	Blood-based (invasive)	Adjunctive short-term glycemic marker; interpretation is limited by incomplete standardization and lack of established clinical targets. [37]
1,5-AG	1–2 weeks [5, 6]	Sensitive to short-term glycemic excursions and postprandial hyperglycemia; complements HbA1c; may improve risk stratification. [5, 6, 33, 50]	Influenced by renal function and glycosuria; interpretation may be compromised in advanced chronic kidney disease, dialysis, pregnancy, and during sodium-glucose cotransporter 2 (SGLT2) inhibitor therapy; limited role as a standalone diagnostic marker. [5, 6, 15, 50]	Serum: blood-based (invasive); saliva: noninvasive, investigational sampling matrix. [18, 29]	Moderate for serum; investigational for saliva. Interpretation requires awareness of the inverse relationship with glucose, renal and glycosuria-related confounding, medication effects, and assay-specific limitations. [5, 6, 18, 29]
Note: Time windows are approximate and may vary according to patient characteristics, assay methodology, and clinical context. 1,5-AG, 1,5-anhydroglucitol; HbA1c, glycated hemoglobin A1c; SGLT2, sodium-glucose cotransporter 2; T2DM, type 2 diabetes mellitus.					

4.4 Point-of-care and biosensor translation

Saliva-based biosensor platforms demonstrate the technical feasibility of detecting several T2DM-relevant analytes using decentralized or wearable formats, including mouthguard-based glucose sensing, conductivity approaches, tongue-depressor platforms, and methylglyoxal detection [22–25]. Broader wearable biosensing research further illustrates the engineering requirements that influence clinical deployment, including

calibration, analytical stability, signal reliability, miniaturization, power and data transmission, and durability within the oral environment [8, 38–41]. Contextual reviews and methods-focused literature additionally highlight matrix interference [29], pre-analytical heterogeneity related to collection, processing, and storage [8, 26–28], and the need for antifouling and calibration strategies to support reliable clinical deployment [38, 39]. These translational features and limitations of the included salivary biosensor platforms are summarized in Table 2.

However, no primary study identified in this review demonstrated a saliva-based 1,5-AG biosensor or wearable device for T2DM case-finding or monitoring. Current 1,5-AG device evidence remains limited to early in vitro assay concepts that were not saliva-based [17], leaving a substantial translational gap between biomarker plausibility and deployable salivary point-of-care testing [29, 42]. Even after analytical validity is established, successful intra-oral deployment will require stable performance under routine oral conditions, adequate selectivity in a complex salivary matrix, reliable calibration and signal transmission, and sufficient device durability. Accordingly, current translational limitations relate not only to biomarker performance but also to assay readiness and device validation.

4.5 Clinical implications and medical-dental integration

Given its noninvasive sampling potential, salivary 1,5-AG may be particularly relevant as a future adjunctive case-finding or triage marker in settings where low-burden sampling is advantageous, including dental and community care [5, 42, 47, 48]. Dental encounters may provide opportunities for identifying individuals with possible dysglycemia and facilitating referral for confirmatory medical assessment [11, 43–48]. The broader oral burden associated with diabetes, including increased caries occurrence and diabetes-related salivary alterations, further supports the relevance of dental settings for integrated oral–systemic risk recognition [49]. Saliva-compatible point-of-care and wearable biosensor platforms developed for other analytes demonstrate the feasibility of decentralized oral-fluid testing [16, 22–25], although these technologies do not establish clinical readiness for salivary 1,5-AG itself.

Its potential value therefore lies not in replacing established diagnostic tests, but in supporting future medical-dental case-finding pathways in which a noninvasive salivary signal prompts confirmatory blood-based testing and appropriate medical follow-up. This positioning reflects the current evidence, which does not support salivary 1,5-AG as a standalone diagnostic test or the use of universal salivary diagnostic thresholds. Importantly, the improved discrimination reported when salivary 1,5-AG was combined with fasting glucose or HbA1c should be distinguished from the potential practical advantage of saliva-based testing. If blood sampling is already required, much of the benefit of a fully noninvasive approach is reduced. The most relevant future use case may therefore be initial noninvasive case-finding or triage in settings where blood testing is not routinely performed, followed by confirmatory blood-based testing when indicated. To clarify its potential role relative to serum testing, Table 4 summarizes the principal clinical and translational differences between serum and salivary 1,5-AG.

Table 4
Serum versus salivary 1,5-anhydroglucitol: clinical interpretation and translational readiness

Domain	Serum 1,5-AG	Salivary 1,5-AG	Key references
Biological meaning	Inverse marker of recent hyperglycemic excursions, mainly reflecting glucosuria-related renal loss of 1,5-AG.	Potential noninvasive surrogate of circulating 1,5-AG, expected to reflect similar short-term glycemic physiology.	[5, 6, 19, 29]
Reported concentration / thresholds	Serum reference intervals vary by sex, population, and assay; reported healthy adult values are generally in the µg/mL range.	Salivary concentrations are lower and method-dependent; reported values include a reference range of 0.09–1.63 µg/mL and proposed thresholds around 0.44 µg/mL for diabetes screening and < 0.054 µg/mL for marked post-meal hyperglycemia.	[18, 21, 32, 50]
Clinical maturity	More established as an adjunctive marker of short-term glycemic control and glycemic variability.	Investigational; promising for screening or triage, but not ready for routine clinical adoption.	[5, 6, 18, 19, 50]
Main limitations	Affected by renal handling, glycosuria, SGLT2 inhibitors, α-glucosidase inhibitors, pregnancy, diet, sex, ethnicity, and assay variability.	Shares systemic confounders and adds saliva-specific issues, including collection heterogeneity, oral contamination, low analyte concentration, and matrix interference.	[5, 8, 26, 29, 50]
Translational role	Adjunctive biomarker, not a replacement for HbA1c, fasting plasma glucose, OGTT, or CGM.	Potential dental/community referral trigger, requiring confirmatory blood-based testing and standardized saliva-ready assays.	[4–6, 18–21, 29, 47, 48]
Note: Reported concentrations and proposed thresholds are method- and population-dependent and should not be interpreted as universal diagnostic cut-offs. Salivary 1,5-AG remains investigational and requires validation against established blood-based markers and reference analytical methods. 1,5-AG, 1,5-anhydroglucitol; CGM, continuous glucose monitoring; HbA1c, glycated hemoglobin A1c; OGTT, oral glucose tolerance test; SGLT2, sodium-glucose cotransporter 2.			

4.6 Future research and implementation pathway

Future studies should move beyond biomarker association and evaluate salivary 1,5-AG within predefined clinical decision pathways. Priorities include standardized saliva collection and processing, systematic reporting of renal, medication-related, oral, dietary, and behavioral confounders, interference-resistant assays benchmarked against reference analytical methods, and prospective multisite validation in real-world workflows. Studies should evaluate clinically meaningful triage thresholds rather than assume universal diagnostic cut-offs and determine whether salivary 1,5-AG provides incremental value beyond established glycemic markers.

Clinical validation should also distinguish between analytical thresholds and thresholds intended to trigger referral or confirmatory testing. This distinction is particularly relevant for dental and community settings, where the purpose of salivary testing would be to identify individuals who may benefit from further medical assessment rather than to establish a diagnosis of T2DM at the point of care.

From a clinical perspective, the most plausible future role of salivary 1,5-AG is therefore as an adjunctive case-finding or triage signal rather than a standalone diagnostic test. Figure 2 illustrates a proposed opportunistic case-finding pathway in which salivary 1,5-AG could be considered for individuals with recognized T2DM risk factors, suggestive symptoms, or relevant oral-health findings encountered in dental, community, or outreach settings, with concerning results prompting confirmatory blood-based testing and medical follow-up.

Note

Proposed future pathway for opportunistic case-finding among individuals with recognized T2DM risk factors, suggestive symptoms, or relevant oral-health findings encountered in dental, community, or outreach settings. Salivary 1,5-AG is presented as a conceptual triage signal rather than a diagnostic test. The referral threshold has not yet been established and requires prospective validation before clinical implementation. A concerning result would prompt confirmatory blood-based testing and subsequent medical evaluation.

4.7 Limitations

This review has limitations. First, the direct clinical evidence base for salivary 1,5-AG remains small and is derived mainly from single-center studies with heterogeneous saliva collection methods, assays, and reporting of pre-analytical conditions. Second, the evidence was synthesized narratively, and meta-analysis was not appropriate because of the limited number and heterogeneity of studies. Third, no saliva-ready 1,5-AG assay validated for routine clinical use or clinically implemented salivary 1,5-AG point-of-care device was identified. Fourth, the biosensor literature included in this review provides indirect platform evidence from other salivary analytes and should not be interpreted as proof of current 1,5-AG device readiness. Fifth, the exclusion of studies involving participants with periodontitis, although intended to reduce oral-inflammatory confounding of salivary biomarker measurements, may limit the generalizability of the findings to real-world dental populations in which periodontal disease is common. Future studies should therefore assess whether periodontal status influences salivary 1,5-AG concentrations or modifies its performance as a case-finding or triage marker. Finally, proposed thresholds remain context-dependent and require prospective multisite validation before clinical use.

5. Conclusion

Salivary 1,5-AG has a coherent biological rationale as a noninvasive marker of short-term glycemic exposure, but current evidence remains insufficient for routine clinical adoption. Reported thresholds and performance estimates come mainly from small, single-center studies using heterogeneous sampling procedures and assays, which limit generalizability across clinical settings. At present, the most defensible near-term role is adjunctive case-finding or triage, rather than replacement of fasting plasma glucose, HbA1c, or oral glucose

tolerance testing. A practical future implementation pathway could involve chairside or near-chairside screening in dental, community, or other accessible settings, followed by referral for confirmatory blood-based testing when indicated.

Abbreviations

1,5-AG, 1,5-anhydroglucitol

AUC, area under the receiver operating characteristic curve

CGM, continuous glucose monitoring

FPG, fasting plasma glucose

HbA1c, glycated hemoglobin A1c

LC-MS/MS, liquid chromatography-tandem mass spectrometry

OGTT, oral glucose tolerance test

POCT, point-of-care testing

PRISMA, Preferred Reporting Items for Systematic Reviews and Meta-Analyses

SGLT2, sodium-glucose cotransporter 2

T2DM, type 2 diabetes mellitus

Declarations

Ethics approval and consent to participate

Not applicable.

Human and Animal Rights

Not applicable. This review did not involve new studies with human participants or animals performed by any of the authors.

Consent for publication

Not applicable.

Availability of data and materials

All data generated or analyzed during this review are included in this manuscript and its supplementary files.

Artificial intelligence disclosure

Generative artificial intelligence tools, specifically ChatGPT by OpenAI, were used to assist with grammar, language refinement, and non-substantive editorial formatting support. No artificial intelligence tool was used to generate, extract, analyze, or interpret scientific data, and no artificial intelligence tool was used to make scientific decisions or conclusions. Figures and graphical content were prepared by the authors using Canva and were reviewed and verified by the authors. All authors reviewed, verified, and approved the final manuscript and remain responsible for its accuracy, originality, and integrity.

Conflict of Interest

The authors declare that they have no conflicts of interest.

Funding

The authors received no specific funding for this work.

Authors' contributions

ABA: Conceptualization; Methodology; Investigation (literature searching and data extraction); Data curation (extraction table); Formal analysis (evidence synthesis and interpretation); Visualization (Figures 1 and 2); Writing-original draft; Writing-review and editing. SE: Investigation (literature searching and data extraction); Data curation (extraction table); Visualization (Figures 1 and 2); Writing-review and editing. PE: Investigation (data extraction); Data curation (extraction table); Writing-review and editing. MA: Investigation (literature searching and data extraction); Data curation (extraction table); Writing-review and editing. AP: Investigation (literature searching and data extraction); Data curation (extraction table); Writing-review and editing. RS: Conceptualization; Investigation (data extraction); Supervision; Visualization (Supplementary Figure S1); Writing-review and editing. All authors contributed to data extraction, critically reviewed the manuscript for important intellectual content, approved the final version for publication, and agreed to be accountable for all aspects of the work.

Acknowledgements

Not applicable.

References

1. World Health Organization (2024) Diabetes. <https://www.who.int/news-room/fact-sheets/detail/diabetes>. Accessed 2 Feb 2026
2. International Diabetes Federation (2025) IDF Diabetes Atlas, 11th edn. International Diabetes Federation, Brussels. <https://diabetesatlas.org/resources/idf-diabetes-atlas-2025/>. Accessed 2 Feb 2026
3. Zhou B, Rayner AW, Gregg EW et al (2024) Worldwide trends in diabetes prevalence and treatment from 1990 to 2022: a pooled analysis of 1108 population-representative studies with 141 million participants. *Lancet* 404:2077–2093. [https://doi.org/10.1016/S0140-6736\(24\)02317-1](https://doi.org/10.1016/S0140-6736(24)02317-1)
4. American Diabetes Association Professional Practice Committee (2024) 6. Glycemic goals and hypoglycemia: Standards of Care in Diabetes-2024. *Diabetes Care* 47(Suppl 1):S111–S125.

<https://doi.org/10.2337/dc24-S006>

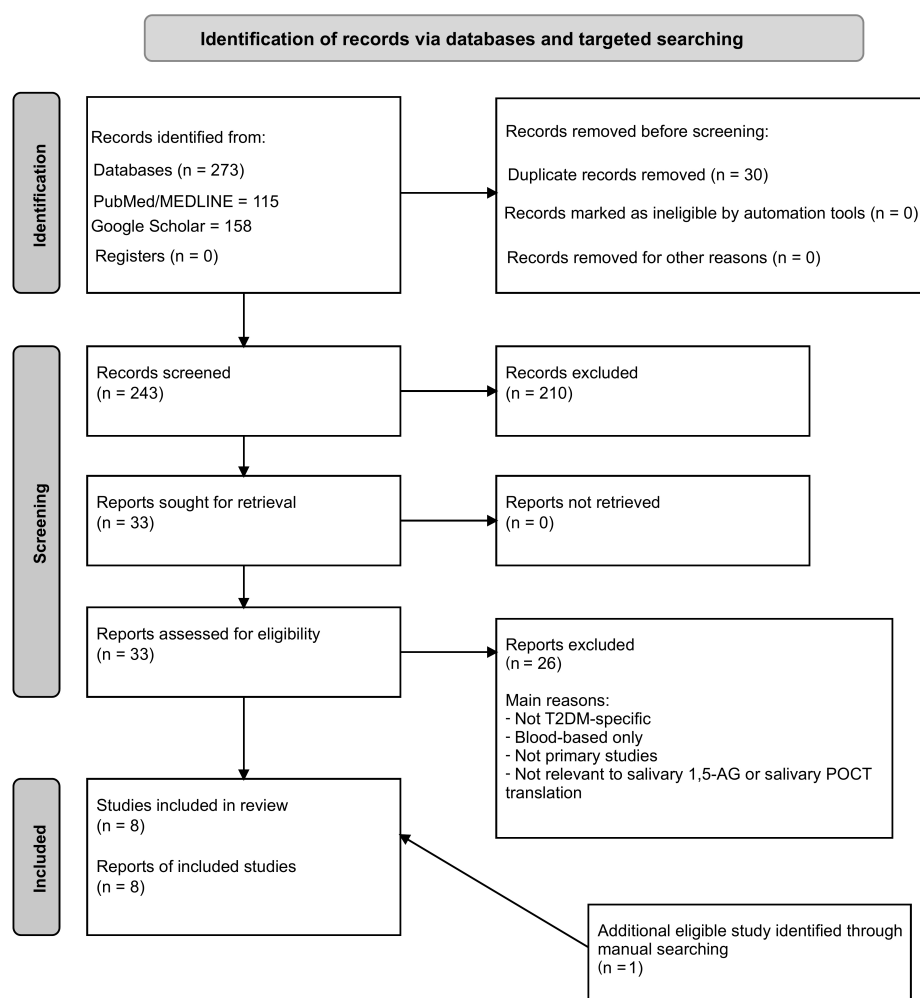
5. Xu H, Pan J, Chen Q (2024) The progress of clinical research on the detection of 1,5-anhydroglucitol in diabetes and its complications. *Front Endocrinol (Lausanne)* 15:1383483. <https://doi.org/10.3389/fendo.2024.1383483>
6. Dungan KM (2008) 1,5-anhydroglucitol (GlycoMark) as a marker of short-term glycemic control and glycemic excursions. *Expert Rev Mol Diagn* 8:9–19. <https://doi.org/10.1586/14737159.8.1.9>
7. Lee Y-H, Wong DT (2009) Saliva: an emerging biofluid for early detection of diseases. *Am J Dent* 22:241–248
8. Kumari S, Samara M, Ampadi Ramachandran R et al (2024) A review on saliva-based health diagnostics: biomarker selection and future directions. *Biomed Mater Devices* 2:121–138. <https://doi.org/10.1007/s44174-023-00090-z>
9. Li Y, Ou Y, Fan K, Liu G (2024) Salivary diagnostics: opportunities and challenges. *Theranostics* 14:6969–6990. <https://doi.org/10.7150/thno.100600>
10. Song M, Bai H, Zhang P, Zhou X, Ying B (2023) Promising applications of human-derived saliva biomarker testing in clinical diagnostics. *Int J Oral Sci* 15:2. <https://doi.org/10.1038/s41368-022-00209-w>
11. Sanz M, Ceriello A, Buysschaert M et al (2018) Scientific evidence on the links between periodontal diseases and diabetes: consensus report and guidelines of the joint workshop on periodontal diseases and diabetes by the International Diabetes Federation and the European Federation of Periodontology. *J Clin Periodontol* 45:138–149. <https://doi.org/10.1111/jcpe.12808>
12. Botelho J, Singh S, Varenne B, Rendell N, Harada Y, Proença L, Machado V, Valentim Bitencourt F (2026) Oral health and diabetes: a systematic review and meta-analysis. *Lancet Public Health* 11:e555–e566. [https://doi.org/10.1016/S2468-2667\(26\)00149-0](https://doi.org/10.1016/S2468-2667(26)00149-0)
13. Ying L, Ma X, Yin J, Wang Y, He X, Peng J et al (2018) The metabolism and transport of 1,5-anhydroglucitol in cells. *Acta Diabetol* 55:279–286. <https://doi.org/10.1007/s00592-017-1093-8>
14. Li M, Maruthur NM, Loomis S et al (2017) Genome-wide association study of 1,5-anhydroglucitol identifies novel genetic loci linked to glucose metabolism. *Sci Rep* 7:2812. <https://doi.org/10.1038/s41598-017-02287-x>
15. Diederich J, Mounkoro P, Tirado HA, Chevalier N, Van Schaftingen E, Veiga-da-Cunha M (2023) SGLT5 is the renal transporter for 1,5-anhydroglucitol, a major player in two rare forms of neutropenia. *Cell Mol Life Sci* 80:259. <https://doi.org/10.1007/s00018-023-04884-8>
16. de Lima LF, Ferreira AL, do Nascimento GHM, Cardoso LP, de Jesus MB, de Araujo WR (2024) Tongue depressor (bio)sensors: a fast decentralized self-testing of salivary biomarkers for personalized medicine. *Chem Eng J* 494:152885. <https://doi.org/10.1016/j.cej.2024.152885>
17. Furusawa H, Ichimura Y, Nagamine K, Shiwaku R, Matsui H, Tokito S (2018) Detection of 1,5-anhydroglucitol as a biomarker for diabetes using an organic field-effect transistor-based biosensor. *Technologies* 6:77. <https://doi.org/10.3390/technologies6030077>
18. Jian C, Zhao A, Ma X, Ge K, Lu W, Zhu W, Wang Y, Zhou J, Jia W, Bao Y (2020) Diabetes screening: detection and application of saliva 1,5-anhydroglucitol by liquid chromatography-mass spectrometry. *J Clin Endocrinol Metab* 105:1759–1769. <https://doi.org/10.1210/clinem/dgaa114>

19. Mook-Kanamori DO, Selim MME-D, Takiddin AH et al (2014) 1,5-Anhydroglucitol in saliva is a noninvasive marker of short-term glycemic control. *J Clin Endocrinol Metab* 99:E479–E483. <https://doi.org/10.1210/jc.2013-3596>
20. Asha ML, Rajarathnam BN, Vinutha N, Kumar H, Premkumar A, Azmi R (2019) Evaluation of 1,5-anhydroglucitol as a salivary biomarker in type 2 diabetes mellitus patients. *J Adv Clin Res Insights* 6:67–71
21. Kedarnath PS, Subramanian SS, Bhaskar E, Kasi M, Pillai V, Subramanian S, Manohar V (2023) Salivary 1,5-anhydroglucitol and its correlation with postprandial hyperglycemia: development and validation of a novel assay. *Int J Appl Basic Med Res* 13:23–28. https://doi.org/10.4103/ijabmr.ijabmr_378_22
22. Arakawa T, Tomoto K, Nitta H, Toma K, Takeuchi S, Sekita T, Minakuchi S, Mitsubayashi K (2020) A wearable cellulose acetate-coated mouthguard biosensor for in vivo salivary glucose measurement. *Anal Chem* 92:12201–12207. <https://doi.org/10.1021/acs.analchem.0c01201>
23. Luo X, Shi W, Liu Y, Sha P, Chu Y, Cui Y (2019) A smart tongue depressor-based biosensor for glucose. *Sensors* 19:3864. <https://doi.org/10.3390/s19183864>
24. Lin C-W, Tsai Y-H, Peng Y-S, Yang J-T, Lu Y-P, Chen M-Y, Tung C-W (2023) A novel salivary sensor with integrated Au electrodes and conductivity meters for screening of diabetes. *Biosens (Basel)* 13:702. <https://doi.org/10.3390/bios13070702>
25. Subramanian V, Amir H, Ponpandian N, Viswanathan C (2024) Non-enzymatic electrochemical detection of methylglyoxal in saliva using a polyaniline/nickel oxide nanohybrid biosensor: a noninvasive approach for diabetes diagnosis. *Biosens Bioelectron X* 17:100444. <https://doi.org/10.1016/j.biosx.2024.100444>
26. Xu S, Mumuni AN, Tuason RTS, Maki KA (2025) Methodological considerations in saliva-based biomarker research: addressing patient-specific variability in translational research protocols. *Curr Protoc* 5:e70235. <https://doi.org/10.1002/cpz1.70235>
27. Bellagambi FG, Lomonaco T, Salvo P, Vivaldi F, Hangouët M, Ghimenti S, Biagini D, Di Francesco F, Fuoco R, Errachid A (2020) Saliva sampling: methods and devices. An overview. *TrAC Trends Anal Chem* 124:115781. <https://doi.org/10.1016/j.trac.2019.115781>
28. Al Habobe H, Haverkort EB, Nazmi K, Van Splunter AP, Pieters RHH, Bikker FJ (2024) The impact of saliva collection methods on measured salivary biomarker levels. *Clin Chim Acta* 552:117628. <https://doi.org/10.1016/j.cca.2023.117628>
29. Halama A, Kulinski M, Kader SA, Satheesh NJ, Abou-Samra AB, Suhre K, Mohammad RM (2016) Measurement of 1,5-anhydroglucitol in blood and saliva: from non-targeted metabolomics to biochemical assay. *J Transl Med* 14:140. <https://doi.org/10.1186/s12967-016-0897-6>
30. Koga M, Murai J, Saito H, Mukai M, Toya D, Tanaka N, Kanehara H, Bando Y, Kasayama S (2011) 1,5-Anhydroglucitol levels are low irrespective of plasma glucose levels in patients with chronic liver disease. *Ann Clin Biochem* 48:121–125. <https://doi.org/10.1258/acb.2010.010053>
31. Taya N, Katakami N, Omori K, Arakawa S, Hosoe S, Watanabe H et al (2021) Evaluation of change in metabolome caused by comprehensive diabetes treatment: a prospective observational study of diabetes inpatients with gas chromatography/mass spectrometry-based non-target metabolomic analysis. *J Diabetes Investig* 12:2232–2241. <https://doi.org/10.1111/jdi.13600>

32. Jian CH, Zhao AH, Ma XJ, Lu W, Zhu W, Wang YF, Zhou J, Bao YQ (2020) A new indicator for blood glucose monitoring: a study of the normal reference range of salivary 1,5-anhydroglucitol. *Chin J Diabetes Mellitus* 12:480–485. <https://doi.org/10.3760/cma.j.cn115791-20191030-00399>
33. Ni J, Chen L, Su H, Cai J, Wang C, Lu W et al (2026) Low serum 1,5-anhydroglucitol is associated with increased risk of all-cause and cardiovascular mortality in type 2 diabetes: a real-world cohort study. *Diabetes Obes Metab* 28:434–442. <https://doi.org/10.1111/dom.70214>
34. Villena Chávez JE, Neira Sánchez ER, Poletti Ferrara LF (2023) Dispersion of serum 1,5 anhydroglucitol values in patients with type 2 diabetes at goal of HbA1c. *Diabetes Res Clin Pract* 199:110668. <https://doi.org/10.1016/j.diabres.2023.110668>
35. Qian J, Chen C, Wang X, Tan Y, Yang J, Yuan Y et al (2022) HbA1c combined with glycated albumin or 1,5-anhydroglucitol improves the efficiency of diabetes screening in a Chinese population. *Diabet Med* 39:e14685. <https://doi.org/10.1111/dme.14685>
36. Su H, Ma XJ, Ying LW, He XX, Zhu W, Tang JL, Wang YF, Bao YQ, Zhou J (2019) Efficiency comparison of fasting plasma glucose combined with 1,5-anhydroglucitol and combined with glycated albumin in diabetes mellitus screening. *J Shanghai Jiao Tong Univ (Med Sci)* 39:1077–1082. <https://doi.org/10.3969/j.issn.1674-8115.2019.09.022>
37. Sacks DB, Arnold M, Bakris GL, Bruns DE, Horvath AR, Lernmark Å, Metzger BE, Nathan DM, Kirkman MS (2023) Guidelines and recommendations for laboratory analysis in the diagnosis and management of diabetes mellitus. *Diabetes Care* 46:e151–e199. <https://doi.org/10.2337/dci23-0036>
38. Johnston L, Wang G, Hu K, Qian C, Liu G (2021) Advances in biosensors for continuous glucose monitoring towards wearables. *Front Bioeng Biotechnol* 9:733810. <https://doi.org/10.3389/fbioe.2021.733810>
39. Pullano SA, Greco M, Bianco MG, Foti D, Brunetti A, Fiorillo AS (2022) Glucose biosensors in clinical practice: principles, limits and perspectives of currently used devices. *Theranostics* 12:493–511. <https://doi.org/10.7150/thno.64035>
40. Brasier N, Wang J, Gao W et al (2024) Applied body-fluid analysis by wearable devices. *Nature* 636:57–68. <https://doi.org/10.1038/s41586-024-08249-4>
41. Li Y, Tang H, Liu Y, Qiao Y, Xia H, Zhou J (2022) Oral wearable sensors: health management based on the oral cavity. *Biosens Bioelectron X* 10:100135. <https://doi.org/10.1016/j.biosx.2022.100135>
42. Cenzato N, Cazzaniga F, Maspero C, Tartaglia GM, Del Fabbro M (2023) SALIVA-based diagnostic approach for diabetes mellitus: a step towards non-invasive detection - a scoping review. *Eur Rev Med Pharmacol Sci* 27:12080–12087. https://doi.org/10.26355/eurrev_202312_34806
43. Fu D, Shu X, Zhou G et al (2025) Connection between oral health and chronic diseases. *MedComm* 6:e70052. [10.1002/mco2.70052](https://doi.org/10.1002/mco2.70052)
44. Lalla E, Kunzel C, Burkett S, Cheng B, Lamster IB (2011) Identification of unrecognized diabetes and pre-diabetes in a dental setting. *J Dent Res* 90:855–860. <https://doi.org/10.1177/0022034511407069>
45. Genco RJ, Schifferle RE, Dunford RG, Falkner KL, Hsu WC, Balukjian J (2014) Screening for diabetes mellitus in dental practices: a field trial. *J Am Dent Assoc* 145:57–64. <https://doi.org/10.14219/jada.2013.7>

46. Chinnasamy A, Moodie M (2020) Prevalence of undiagnosed diabetes and prediabetes in the dental setting: a systematic review and meta-analysis. *Int J Dent* 2020:2964020.
<https://doi.org/10.1155/2020/2964020>
47. Chee HK, Abbas F, van Winkelhoff AJ, Tjakkes GH, Htoon HM, Li H, de Waal Y, Vissink A, Seneviratne CJ (2025) Identifying undiagnosed diabetes and prediabetes in the dental setting in an Asian population: a clinical risk model. *J Clin Periodontol* 52:324–338. <https://doi.org/10.1111/jcpe.14090>
48. Sandhu S, Houlston E, Dhadwal A, Yonel Z (2025) Improving integrated care pathways between medical and dental specialities in the management of type 2 diabetes: a review of the literature over the last 5 years. *Curr Oral Health Rep* 12:28. <https://doi.org/10.1007/s40496-025-00420-8>
49. Zhou G, Shu X, Long Y, Cao Y, Wang J, Liao G, Zou L (2024) Dental caries and salivary alterations in patients with type 2 diabetes: a systematic review and meta-analysis. *J Dent* 150:105321.
<https://doi.org/10.1016/j.jdent.2024.105321>
50. Xu H, Tang Q, Chen Q (2026) 1,5-Anhydroglucitol: from short-term glycemic monitoring to risk stratification of diabetes complications. *Diabetes Metab Syndr Obes* 19:596620.
<https://doi.org/10.2147/DMSO.S596620>

Figures



Source: Page MJ, et al. BMJ 2021;372:n71. doi: 10.1136/bmj.n71.

This work is licensed under CC BY 4.0: <https://creativecommons.org/licenses/by/4.0/>

Figure 1

Study selection flow diagram for the focused translational review.

Note: Records were identified through database and manual searching, screened according to the eligibility criteria, and retained for narrative synthesis. The diagram follows the general structure of the PRISMA 2020 flow diagram but does not represent a formal PRISMA systematic review.

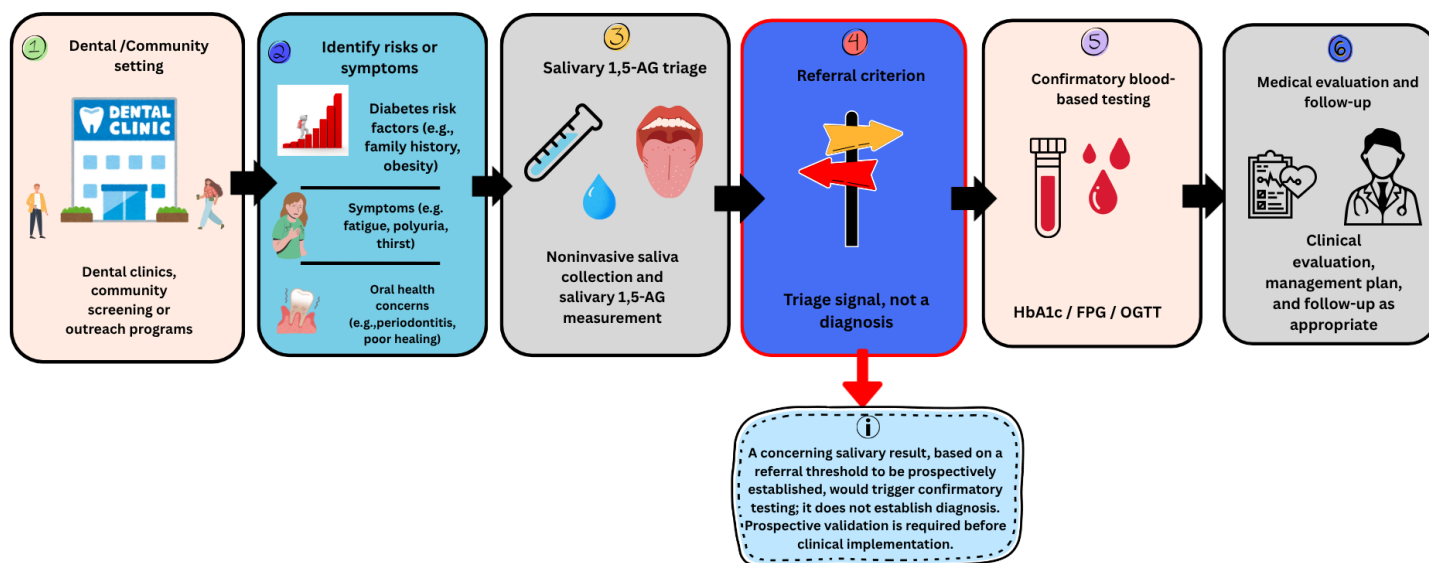


Figure 2

Proposed clinical pathway for adjunctive salivary 1,5-AG–based case-finding and referral

Note: Proposed future pathway for opportunistic case-finding among individuals with recognized T2DM risk factors, suggestive symptoms, or relevant oral-health findings encountered in dental, community, or outreach settings. Salivary 1,5-AG is presented as a conceptual triage signal rather than a diagnostic test. The referral threshold has not yet been established and requires prospective validation before clinical implementation. A concerning result would prompt confirmatory blood-based testing and subsequent medical evaluation.

Supplementary Files

This is a list of supplementary files associated with this preprint. Click to download.

- [SupplementaryAppendixS1.Searchtermsandstrategies.docx](#)
- [SupplementaryFigureS1.Salivacollectionandpreanalyticalworkflow..docx](#)