# **Berberis *vulgaris* (Barberry) and Diabetes Mellitus: A Clinical Evidence Review**

## **Abstract**

**Background:** *Berberis vulgaris* (barberry) contains protoberberine alkaloids—most notably berberine—studied for antihyperglycemic effects.  
 **Objective:** To synthesize clinical evidence on *B. vulgaris* preparations and isolated berberine for glycemic control, lipids, weight, and safety in diabetes.  
 **Methods:** Narrative review emphasizing recent randomized controlled trials (RCTs), meta-analyses, and safety statements.  
 **Results:** RCTs of *Berberis* fruit/root extracts and meta-analyses report modest but significant reductions in fasting plasma glucose (FPG), HbA1c, and HOMA-IR versus placebo, with small or non-significant effects on 2-hour post-prandial glucose, weight, and BMI. Trials of isolated berberine—chemically present in *B. vulgaris*—demonstrate clinically meaningful HbA1c and lipid improvements, though heterogeneity, small samples, and regional concentration of studies limit certainty. GI adverse effects are most common; pregnancy and lactation are contraindications due to kernicterus risk in newborns.  
 **Conclusions:** *B. vulgaris* preparations can provide small adjunctive benefits for type 2 diabetes, and berberine shows moderate efficacy comparable to first-line agents in some trials. Higher-quality, multinational RCTs of standardized *B. vulgaris* extracts are needed to establish dose, durability, and safety alongside conventional therapy. ([PubMed](https://pubmed.ncbi.nlm.nih.gov/39413550/), [brieflands.com](https://brieflands.com/articles/ijpr-125856.html?utm_source=chatgpt.com), [PMC](https://pmc.ncbi.nlm.nih.gov/articles/PMC2410097/?utm_source=chatgpt.com), [Frontiers](https://www.frontiersin.org/journals/pharmacology/articles/10.3389/fphar.2024.1455534/full?utm_source=chatgpt.com))

## **Introduction**

Hyperglycemia in type 2 diabetes mellitus (T2DM) reflects impaired insulin secretion and/or insulin resistance, driving micro- and macrovascular complications. Interest in phytotherapeutics has renewed focus on *B. vulgaris*, whose fruit, root, and bark contain berberine and related alkaloids with putative metabolic effects. While berberine has a substantial clinical literature, fewer studies test whole-plant *Berberis* extracts directly in people with diabetes. This review distinguishes outcomes from *Berberis* extracts vs. isolated berberine and summarizes efficacy and safety. ([PubMed](https://pubmed.ncbi.nlm.nih.gov/39413550/), [Frontiers](https://www.frontiersin.org/journals/pharmacology/articles/10.3389/fphar.2020.00041/full?utm_source=chatgpt.com))

## **Pharmacology and Mechanisms**

Barberry’s principal bioactives include berberine, berbamine, and palmatine. Proposed antidiabetic mechanisms (largely demonstrated for berberine) include: activation of AMP-activated protein kinase (AMPK) improving insulin signaling and glucose uptake; reduced intestinal glucose absorption; modulation of gut microbiota; decreased hepatic gluconeogenesis; and potential α-glucosidase inhibition. These actions collectively lower FPG and improve HOMA-IR; lipid-lowering effects are attributed to hepatic AMPK/LXR signaling. ([diabetesjournals.org](https://diabetesjournals.org/diabetes/article/55/8/2256/12348/Berberine-a-Natural-Plant-Product-Activates-AMP?utm_source=chatgpt.com), [PMC](https://pmc.ncbi.nlm.nih.gov/articles/PMC10376565/?utm_source=chatgpt.com))

## **Clinical Evidence**

### **Meta-analyses of *Berberis* Extracts**

A 2024 meta-analysis of 9 RCTs (n=547) testing *Berberis* (*vulgaris* or *integerrima*) against placebo or metformin in T2DM found significant reductions in FPG (WMD −14.52 mg/dL), HbA1c (−0.30 %), and HOMA-IR (−0.97), without significant effects on 2-h PPG, fasting insulin, fructosamine, weight, or BMI. Risk-of-bias concerns and geographic concentration (predominantly Iran) were noted. ([PubMed](https://pubmed.ncbi.nlm.nih.gov/39413550/))

A 2020 meta-analysis similarly reported modest HbA1c and FPG reductions with barberry supplementation, supporting small adjunctive effects on glycemia. (Context from abstracted findings.) ([PubMed](https://pubmed.ncbi.nlm.nih.gov/39413550/))

### **Randomized Trials of *Berberis* Extracts**

* ***B. vulgaris* fruit extract in T2DM:** In a randomized trial of 42 adults with diabetes, barberry fruit extract significantly reduced triglycerides, total and LDL-cholesterol, apoB, insulin resistance, glucose, and increased total antioxidant capacity versus placebo over the study period. (Primary lipid endpoints; glycemic indices also improved.) ([brieflands.com](https://brieflands.com/articles/ijpr-125856.html?utm_source=chatgpt.com))
* ***B. vulgaris* root extract:** A randomized clinical trial of *B. vulgaris* root extract in T2DM suggested improvements in glucose metabolism and lipids with acceptable safety; full quantitative details were limited by access to the article, but directionality favored the active arm. ([ScienceDirect](https://www.sciencedirect.com/science/article/abs/pii/S1876382019311485?utm_source=chatgpt.com))
* ***B. integerrima* fruit extract:** Additional RCTs in Iranian cohorts show improved insulin indices and glycemic parameters; however, sample sizes are small and formulations vary, underscoring the need for standardization. ([PMC](https://pmc.ncbi.nlm.nih.gov/articles/PMC8275404/?utm_source=chatgpt.com))

### **Trials of Isolated Berberine (Relevance to *B. vulgaris*)**

Pivotal clinical studies of berberine—an alkaloid abundant in *B. vulgaris*—demonstrate antihyperglycemic and hypolipidemic effects:

* **Pilot and comparative RCTs (China):** Berberine 0.5 g two or three times daily lowered HbA1c (~0.9% in one double-blind study), FPG, PPG, and improved lipids; GI adverse events (constipation, diarrhea, abdominal discomfort) were common but transient. ([PMC](https://pmc.ncbi.nlm.nih.gov/articles/PMC2410097/?utm_source=chatgpt.com), [metabolismjournal.com](https://www.metabolismjournal.com/article/S0026-0495%2808%2900046-2/abstract?utm_source=chatgpt.com), [ScienceDirect](https://www.sciencedirect.com/science/article/abs/pii/S0026049509003163?utm_source=chatgpt.com))
* **Recent syntheses:** Overviews and meta-analyses conclude berberine improves glycemia and lipids in T2DM, alone or with standard drugs (e.g., metformin), though study quality and heterogeneity limit certainty. ([PMC](https://pmc.ncbi.nlm.nih.gov/articles/PMC12016319/?utm_source=chatgpt.com), [Frontiers](https://www.frontiersin.org/journals/pharmacology/articles/10.3389/fphar.2024.1455534/full?utm_source=chatgpt.com), [Wiley Online Library](https://onlinelibrary.wiley.com/doi/10.1155/2021/2074610?utm_source=chatgpt.com), [mednexus.org](https://mednexus.org/doi/10.1097/CD9.0000000000000087?utm_source=chatgpt.com))
* **Emerging derivatives:** A 2025 randomized trial evaluated berberine-ursodeoxycholate (BUDCA) as a novel formulation aimed at improving tolerability and metabolic effects, signalling ongoing clinical development. (Mechanistic/derivative relevance rather than direct *Berberis* use.) ([JAMA Network](https://jamanetwork.com/journals/jamanetworkopen/fullarticle/2830820?utm_source=chatgpt.com))

## **Magnitude of Effect and Clinical Meaning**

Across *Berberis* extract trials, HbA1c reductions are modest (~0.3% in the 2024 meta-analysis), likely below typical thresholds for monotherapy but potentially useful as adjuncts to lifestyle or pharmacotherapy. Isolated berberine has shown larger effects (HbA1c reductions ~0.5–1.0% in some trials), yet variation in product quality, bioavailability, and trial rigor complicates translation. ([PubMed](https://pubmed.ncbi.nlm.nih.gov/39413550/), [PMC](https://pmc.ncbi.nlm.nih.gov/articles/PMC2410097/?utm_source=chatgpt.com))

## **Formulations and Dosing**

*Berberis* interventions have included fruit juice, hydroalcoholic fruit/root extracts, and standardized capsules; dosing ranged widely (e.g., ~500–1000 mg/day of extract equivalents in small RCTs). For berberine, common research doses are 500 mg two or three times daily. Absorption is low; salts and derivatives (e.g., BUDCA) are being explored to enhance bioavailability. Clinicians should verify standardization (berberine content) and avoid extrapolating berberine doses directly to whole-plant products without validated equivalence. ([brieflands.com](https://brieflands.com/articles/ijpr-125856.html?utm_source=chatgpt.com), [PMC](https://pmc.ncbi.nlm.nih.gov/articles/PMC2410097/?utm_source=chatgpt.com), [JAMA Network](https://jamanetwork.com/journals/jamanetworkopen/fullarticle/2830820?utm_source=chatgpt.com))

## **Safety, Interactions, and Special Populations**

* **Common adverse effects:** GI symptoms (constipation, diarrhea, abdominal discomfort) predominate with berberine; *Berberis* extracts appear well tolerated in short trials. ([PMC](https://pmc.ncbi.nlm.nih.gov/articles/PMC2410097/?utm_source=chatgpt.com))
* **Pregnancy and lactation:** Avoid *Berberis*/berberine—risk of neonatal jaundice and kernicterus; berberine may transfer via breast milk. ([Memorial Sloan Kettering Cancer Center](https://www.mskcc.org/cancer-care/integrative-medicine/herbs/berberine?utm_source=chatgpt.com), [ווב.מד](https://www.webmd.com/vitamins/ai/ingredientmono-1126/berberine?utm_source=chatgpt.com), [PMC](https://pmc.ncbi.nlm.nih.gov/articles/PMC5478780/?utm_source=chatgpt.com))
* **Drug interactions:** Berberine can inhibit CYP2D6/2C9 and P-glycoprotein; clinically relevant interactions (e.g., with cyclosporine) have been reported. Caution with hypoglycemic agents (additive effects). ([ScienceDirect](https://www.sciencedirect.com/science/article/pii/S1878535221005773?utm_source=chatgpt.com), [PMC](https://pmc.ncbi.nlm.nih.gov/articles/PMC8146483/?utm_source=chatgpt.com), [Integrative Pharmacology](https://integrativepharmacology.com/2019/10/20/berberine-pharmacodynamics-biovailability-and-drug-interactions/?utm_source=chatgpt.com))
* **Guideline perspective:** Major diabetes organizations do not recommend routine use of supplements, including botanicals, for glycemic control absent deficiency; if used, they should complement—not replace—evidence-based therapy. ([עמותה לסוכרת](https://diabetes.org/food-nutrition/diabetes-vitamins-supplements?utm_source=chatgpt.com))

## **Limitations of the Evidence**

Trials of *Berberis* extracts are few, small, short in duration, use varied plant parts/formulations, and are geographically clustered—factors that raise risks of publication bias and limit generalizability. Berberine trials, though more numerous, also show heterogeneity, and many predate contemporary trial standards. Longer, multicenter, head-to-head RCTs with standardized extracts are needed to define additive value on top of guideline-directed care. ([PubMed](https://pubmed.ncbi.nlm.nih.gov/39413550/))

## **Practical Clinical Takeaways**

1. *Berberis* fruit/root extracts can modestly improve FPG/HbA1c and insulin resistance; effects on weight and 2-h PPG are inconsistent. ([PubMed](https://pubmed.ncbi.nlm.nih.gov/39413550/))
2. Isolated berberine shows moderate glycemic and lipid benefits but causes GI effects and has interaction/contraindication considerations. ([PMC](https://pmc.ncbi.nlm.nih.gov/articles/PMC2410097/?utm_source=chatgpt.com), [ווב.מד](https://www.webmd.com/vitamins/ai/ingredientmono-1126/berberine?utm_source=chatgpt.com))
3. Consider only as an **adjunct** for motivated adults with T2DM already on lifestyle therapy ± pharmacotherapy, with monitoring for hypoglycemia and interactions. Avoid in pregnancy/lactation. ([עמותה לסוכרת](https://diabetes.org/food-nutrition/diabetes-vitamins-supplements?utm_source=chatgpt.com), [Memorial Sloan Kettering Cancer Center](https://www.mskcc.org/cancer-care/integrative-medicine/herbs/berberine?utm_source=chatgpt.com))

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### **Notes on Scope**

Most direct clinical data on *B. vulgaris* involve Iranian RCTs using fruit/root extracts with variable standardization, while a larger, international literature evaluates **berberine** (a major *Berberis* alkaloid) as an isolated compound. Where possible, this review distinguishes those bodies of evidence and highlights the need for standardized *B. vulgaris* products and multinational trials. ([PubMed](https://pubmed.ncbi.nlm.nih.gov/39413550/))