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Review Article

Evidence Landscape of *Shilajatu* (*Asphaltum punjabinum*) in the Management of Diabetes Mellitus: A Scoping Review

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ABSTRACT

Shilajatu (*Asphaltum punjabinum*), a herbo-mineral exudate described in Ayurveda as a *Rasayana*, has been traditionally indicated in *Prameha* (diabetes mellitus). Its chemical matrix, enriched with fulvic acids, dibenzo-α-pyrones, and trace elements, is proposed to influence insulin signalling, mitochondrial function, oxidative balance, and lipid homeostasis. To systematically map and synthesize the available preclinical and clinical evidence regarding the antidiabetic efficacy of *Shilajatu*, a scoping review was conducted in accordance with PRISMA-ScR guidelines. Electronic databases (PubMed, Scopus, Web of Science, Google Scholar, and AYUSH Research Portal) were searched from 1980 to December 2025. Eligible studies included *in vivo* experimental models and clinical investigations evaluating glycaemic and diabetes-related outcomes following oral administration of *Shilajatu*. Data were charted using standardized extraction templates and synthesized descriptively. Out of 152 identified records, seven studies fulfilled eligibility criteria, comprising four *in vivo* studies, two clinical trials, and one case report. Preclinical findings demonstrated significant attenuation of hyperglycaemia, improved insulin sensitivity (including reductions in HOMA-IR), restoration of antioxidant enzyme activity (Superoxide dismutase, Catalase, Glutathione peroxidase), suppression of inflammatory mediators, and protection against diabetes-associated organ damage. Clinical studies reported reductions in fasting blood glucose (18.04-26.03%) and postprandial glucose (19.29-27.75%) over 8-12 weeks, with parallel improvement in classical diabetic symptoms and lipid parameters. A case report documented a reduction in HbA_{1c} from 12.8% to 7.3% over 90 days. Available evidence indicates that *Shilajatu* exerts multimodal antidiabetic effects through coordinated metabolic, oxidative, and inflammatory pathway modulation. However, larger randomized controlled trials with standardized preparations and validated biomarkers are required to establish definitive clinical efficacy and translational relevance.

Keywords: Asphaltum punjabinum, Diabetes mellitus, Insulin sensitivity, Oxidative stress, Scoping review, *Shilajatu*.

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INTRODUCTION

Shilajatu (*Asphaltum punjabinum*) is a naturally occurring mineral exudate formed through the long-term humification of plant and microbial matter under specific geological conditions. In Ayurveda system of medicine, it is classified as *Rasayana*/rejuvenator (Mittal *et al*., 2009) and valued as *Yogavahi* (synergistic carrier). It has documented use in the management of various chronic metabolic disorders, specifically *Prameha*, a clinical condition closely aligned with diabetes mellitus, where it is indicated to alleviate cardinal diabetic symptoms such as polyuria, polydipsia, and fatigue etc., (Kumar *et al*., 2014; Shusruta Samhita, 2007). Chemically, *Shilajatu* represents a complex herbo-mineral matrix rich in humic substances, particularly fulvic acids and dibenzo-α-pyrones (Khanna *et al*., 2008), along with a diverse spectrum of trace elements such as chromium, zinc, and manganese (Ghosal *et al*., 1976). These constituents have been implicated in the modulation of insulin signalling pathways, enhancement of cellular glucose uptake, and attenuation of oxidative stress. The convergence of these biochemical activities provides a plausible mechanistic basis for its traditional use in glycaemic regulation.

In recent decades, *Shilajatu* has attracted increasing scientific attention as a potentially effective intervention for diabetes management. Preclinical studies in streptozotocin-induced diabetic rats have consistently demonstrated its anti-hyperglycaemic and lipid-modulating effects, exhibiting significant reductions in fasting blood glucose and improvements

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in lipid profiles. Further, studies have also reported its significant antioxidant and anti-inflammatory activities, suggesting potential relevance in mitigating oxidative stress driven insulin resistance and secondary diabetic complications. Notably, its administration has been reported to reduce hyperglycaemia by more than 50% and suppress advanced glycation end product formation, with efficacy comparable to standard antidiabetic agents such as glibenclamide. Published clinical evidence, though seven in numbers, further supports these *in vivo* findings. Various controlled and open-label clinical trials have reported substantial reductions in fasting and postprandial blood glucose levels, accompanied by marked symptomatic relief in a majority of patients, following *Shilajatu* administration over three months. Notably, selected comparative studies have suggested equivalence between *Shilajatu*-based interventions and first-line pharmacotherapies in improving glycaemic indicators, including HbA_{1c}, without significant adverse effects.

Despite these promising clinical outcomes, the existing evidence base on antidiabetic potential of *Shilajatu* remains fragmented across experimental studies, case reports, and clinical trials, lacking comprehensive synthesis. The absence of a structured synthesis of scientific data limits the ability to critically appraise the consistency, strength, and translational relevance of existing evidence. This represents a critical knowledge gap, particularly given the rising global diabetes prevalence, growing interest in integrative and evidence-based approaches to diabetes care. Therefore, the present scoping review aims to systematically map and synthesize the available evidence on the role of *Shilajatu* in the management of diabetes mellitus, encompassing spanning from experimental pharmacology to clinical outcomes. By integrating data from classical Ayurvedic texts with contemporary biomedical research, this review seeks to provide a coherent and structured overview of its therapeutic potential in diabetes management while identifying key gaps to design future experimental and clinical studies.

METHODOLOGY

Study Design and Reporting Framework

This scoping review was conducted in accordance with the methodological framework proposed by Arksey and O'Malley (2005) and further refined by Danielle and O'Brien (2012). The review is reported following the PRISMA-ScR (Preferred Reporting Items for Systematic Reviews and Meta-Analyses extension for Scoping Reviews) guidelines to ensure transparency and methodological rigour (Page *et al.*, 2021; Tricco *et al.*, 2018). The five sequential stages of a scoping review were applied: (1) Identifying the research question, (2) Identification of Relevant Studies, (3) Eligibility Criteria for the studies, (4) Study selection, (5) Information Sources and Search Process, (6) Final Inclusion of Eligible Studies, (7) Data Extraction and Charting and (8) Data Synthesis and reporting of results.

Identifying the research question

What is the extent, nature, and scope of evidence regarding the therapeutic efficacy of *Shilajatu* (*Asphaltum punjabinum*) in the management of diabetes mellitus?

Identification of Relevant Studies

The study employed a comprehensive search strategy to identify both clinical and experimental studies on *Shilajatu's* antidiabetic effects, thereby ensuring reproducibility of results. The development of the search strategy was guided by the methodological recommendations of Aromataris and Riitano (2014). For clinical studies, a PICOT framework was employed (Population: patients with diabetes or prediabetes; Intervention: *Shilajatu* or *Shilajatu*-based therapy; Concept/context: efficacy or therapeutic outcomes; Outcomes: glycaemic control and related parameters; Time: 1980-December 2025. For experimental studies, a modified PICOT framework was applied (Population: Diabetic animal models; Intervention: *Shilajatu* or *Shilajatu*-based therapy; Comparison: placebo or standard drug where applicable; Outcomes: biochemical and physiological endpoints; Study design: efficacy studies). The study included a broad range of synonyms and related terms for *Shilajatu* and diabetes. The search terms included variations of the drug name - *"Shilajit", "Shilajatu", "Asphaltum punjabinum", "mineral pitch", "mumie"* - combined with diabetes-related terms (*"diabetes mellitus", "Madhumeha", "hyperglycemia"*, etc.) using Boolean operators. Detailed database-specific search strings are provided in Supplementary File 1.

Eligibility Criteria for the Studies

Peer-reviewed original research articles were considered for inclusion in the review, if they met all the following inclusion criteria:

Inclusion Criteria

Intervention/Scope

Studies evaluating the therapeutic or pharmacological effects of *Shilajatu* (alone or as a principal component of a formulation) on diabetes-related outcomes, administered orally.

Outcomes

The study must report diabetes-relevant endpoints, including blood glucose, glycosylated Haemoglobin (HbA_{1c}), insulin levels or sensitivity, lipid profile, diabetic complications, or symptom-based outcomes.

Study Design

Original experimental (*in vivo* diabetic animal models) and clinical studies (randomized or non-randomized trials, observational studies, case series, and case reports) aligning with the objective of the scoping review.

Language and Timeframe

Studies published in English between 1980 and December 2025.

Exclusion Criteria

Articles limited to toxicity, safety, analytical standardization, or chemical profiling without therapeutic evaluation.

In vitro studies of Diabetes mellitus

Publication Type

Review articles, meta-analyses, conference abstracts, editorials, commentaries, opinion pieces, and grey literature.

Information Sources and Search Process

Electronic literature searches were conducted in PubMed/MEDLINE, Scopus, Google Scholar and Web of Science. To ensure coverage of relevant regional/Ethnic and Ayurvedic research not indexed in major biomedical databases, the AYUSH Research Portal was also searched. Initial search was conducted in July 2025 and updated in December 2025 to include newly published studies. A pilot search in PubMed was performed to refine keyword combinations and search syntax, confirming the retrieval of key reference articles. A sample combined search string used in PubMed was: (*Shilajatu*) OR (*Shilajita*) OR (mumie) OR (mumiyo) OR (mineral pitch) OR (black bitumen) AND (2000/1/1:2025/5/17[pdat]) AND (Diabetes) OR (Diabetes mellitus) OR (Type 2 diabetes) OR (*Prameha*) OR (*Madhumeha*) NOT (Diabetes insipidus) All identified records were imported into Mendeley (v1.19.8) for reference management. Duplicate records were removed through automated and manual screening.

Final Inclusion of Eligible Studies

The study selection process followed a two-stage screening approach and is illustrated in a PRISMA-ScR flow diagram (Figure 1). After de-duplication, two reviewers independently screened titles and abstracts of all retrieved records to exclude irrelevant articles. Full-text articles were then independently assessed against eligibility criteria. Any disagreements in study inclusion were resolved through discussion, with arbitration by a third reviewer when needed. To ensure consistency, the included studies were rechecked against the criteria by both reviewers before final inclusion. Reference lists of included studies were hand-searched to identify additional eligible publications.

Data Extraction and Charting

A standardized data extraction form was developed and pilot-tested. Separate templates were used for experimental and clinical studies to account for differences in the number of data points. For preclinical studies, data were extracted on animal species and experimental model, method of diabetes induction (including streptozotocin dose where applicable), *Shilajatu* form and dosage, duration of intervention, and principal outcomes, including changes in blood glucose, biochemical parameters, and histopathological findings. For clinical studies, extracted information comprised participant characteristics (sample size and diabetes type), intervention details (dose, formulation, and any co-interventions, etc.), treatment duration, outcome measures (glycaemic indices, lipid profile, symptom-based assessments, and adverse events), and the key reported findings. Data extraction was performed independently by two reviewers; their results were compared and consolidated. Any discrepancies or ambiguities in data extraction were resolved by a third reviewer through cross-checking the original article. Extracted data were summarised in Tables 1-3. Consistent with scoping review methodology, no formal risk-of-bias assessment was conducted. However, any methodological limitations were documented during data charting to provide contextual interpretation.

Data Synthesis

Given the heterogeneity of study designs, interventions, and outcome measures, results were synthesized descriptively. Studies were grouped into preclinical (animal studies) and clinical studies, and further organized by major outcome domains. No meta-analysis was performed, in line with the exploratory objectives of this scoping review.

RESULTS

Study Selection

The literature search identified a total of 152 records (PubMed, n = 92; Web of Science, n = 40; Scopus, n = 10; Google Scholar, n = 10). After removal of five duplicate records, 147 citations were screened based on titles and abstracts, resulting in the exclusion of 14 irrelevant articles. The remaining 133 records underwent full-text assessment, of which 126 studies were excluded for not meeting the predefined inclusion criteria. The primary reasons for exclusion included review articles (n = 38), observational or epidemiological study designs (n = 10), lack of Shilajatu as a primary intervention (n = 20), absence of relevance to diabetes mellitus (n = 56), and *in vitro* investigations (n = 2). Ultimately, seven studies satisfied all eligibility criteria and were included in the final synthesis. These studies, published between 1995 and 2025, form the evidence base of the present review. The study selection process is illustrated in the PRISMA flow diagram (Figure 1).

General Characteristics of Included Studies

Among the seven included studies, the evidence base comprised four preclinical (*in vivo*) investigations, two clinical trials, and one case report. The preclinical studies employed experimental diabetic animal models to assess biochemical, hormonal, and histopathological outcomes following *Shilajatu* administration evaluated the therapeutic efficacy of *Shilajatu* either as a standalone intervention or in comparison with other Ayurvedic

formulations in patients with type 2 diabetes mellitus. The remaining study was a detailed case report. documenting significant glycaemic improvements through the administration of a formulation containing *Shilajatu* and *Daruharidra* (*Berberis aristata* DC.).

DISCUSSION

This present review synthesises and systematically maps the evidence by integrating findings from available experimental, clinical, and case-based studies to elucidate the antidiabetic potential of *Shilajatu*. The review provides a structured framework bridging Ayurvedic rationale with contemporary biomedical observations, highlighting both traditional rationale and scientific validation. Despite heterogeneity in study design and outcome measures: *Shilajatu* exhibits multimodal antidiabetic activity with a favourable efficacy profile. Its antidiabetic activity can be mechanistically interpreted through coordinated modulation of metabolic, oxidative, and endocrine axis or pathways. The available evidence indicates that *Shilajatu* influences insulin signalling, mitochondrial function, redox homeostasis, and hormone-responsive tissues, thereby targeting upstream drivers of diabetes pathophysiology rather than producing isolated glycaemic control effects.

Across the included clinical and experimental studies, *Shilajatu*-based interventions demonstrated consistent, clinically meaningful improvements in objective biochemical parameters, subjective symptomatology, and Quality-of-Life (QOL) indices, supporting its multimodal role in the management of diabetes and its complications.

Among clinical trials, reductions in Fasting Blood Sugar (FBS) ranged from 18.04% to 26.03%, while Postprandial Blood Sugar (PPBS) reductions ranged from 19.29% to 27.75% over treatment durations of 8 weeks to 3 months. Glycaemic control was further corroborated by improvements in HbA_{1c}, with the case report documenting a 42.9% reduction (12.8% to 7.3%). Lipid profile improvements were also notable, particularly reductions in total cholesterol (≈27 mg/dL) and LDL cholesterol (≈20 mg/dL), indicating ancillary cardiometabolic benefits.

Subjective symptom relief was substantial in classical *Prameha* presentations, with polyuria (69-80%), polydipsia (77-81%), polyphagia (70-74%), and loss of libido (≈93%) showing marked improvement following *Shilajatu* administration. Importantly, combination therapies incorporating *Medhya Rasayana* (e.g., *Shankhapushpi*) resulted in superior psychological and cognitive outcomes, evidenced by 38.28% improvement in BPRS scores, compared to 14.59% with herbo-mineral therapy alone.

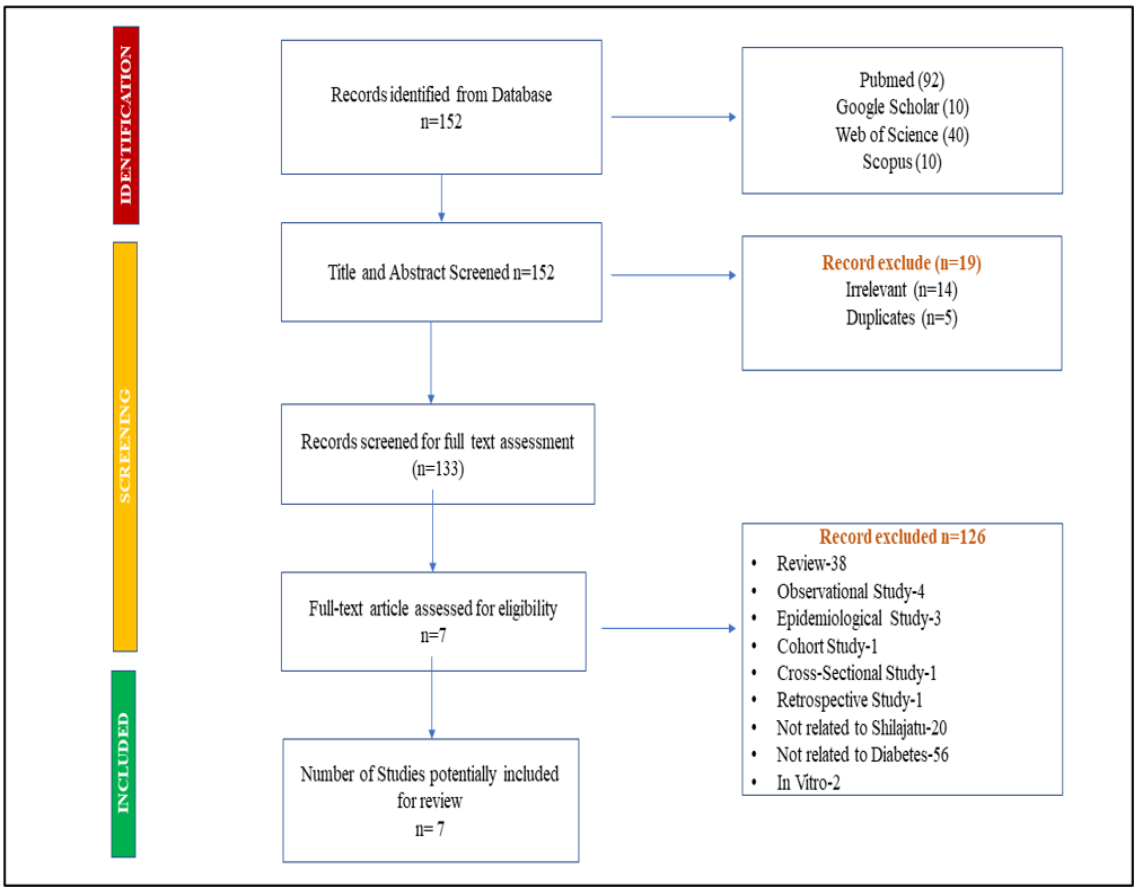

Figure 1: Prisma Flow Diagram of Selected Studies.

Table 1: General Characteristics of selected studies.

Sl. No.	Author/Year/Journal	Title	Study type
1.	Singh R, Yadav P, Patel A, Prajapati PK. 2025. Journal of Medical Case Reports. 19(1).	The synergy between *Shilajatu* (*Asphaltum punjabinum*) and *Daruharidra* (*Berberis aristata DC.*), curtails the glycaemic indicators and alleviates the symptoms of type 2 diabetes: a case report	Case report
2.	Rajpoot A, Pandey AK, Roy VK, Mishra RK. 2025. Andrologia. 2025(1).	*Shilajit* Mitigates Diabetes-Induced Testicular Dysfunction in Mice: A Modulation in Insulin Sensitivity, Germ Cell-Junctional Dynamics, and Oxido-Apoptotic Status.	*In vivo*
3.	Reddy KS, Sudheer A, Pradeepkumar B, Reddy CS. 2019. Indian Journal of Pharmacology. 51(5).	Effect of a polyherbal formulation in streptozotocin-induced diabetic nephropathy in Wistar rats.	*In vivo*
4.	Singh RH, Chansouria JP. 1996. Ancient Science of Life. 16(2).	Hypoglycaemic Property of *Shilajeet* and *Yashada Bhasma*	*In vivo*
5.	Bhattacharya SK. 1995. Phytotherapy Research. 9(1).	*Shilajit* Attenuates Streptozotocin Induced Diabetes Mellitus and Decrease in Pancreatic Islet Superoxide Dismutase Activity in Rats	*In vivo*
6.	Gupta V, Keshari BB, Tiwari SK, Murthy KN. 2016. AYU. 37(2).	A comparative study of *Shilajatu* and *Asanadi Ghana Vati* in the management of *Madhumeha* w.s.r. to type-2 diabetes mellitus	Clinical trial
7.	Patel DV, Chandola H, Baghel MS, Joshi JR. 2012. AYU. 33(2).	Clinical efficacy of *Shankhapushpi* and a herbo-mineral compound in type-II diabetes	Clinical trial

Quality-of-life outcomes, though sparsely reported, showed robust improvement, particularly in the case report, where QOL scores improved from 67 to 142, representing more than a 2-fold increase, alongside parallel biochemical normalisation. This underscores the relevance of *Shilajatu* not only in metabolic correction but also in functional and psychosocial restoration.

Preclinical studies further reinforced these findings, demonstrating significant attenuation of hyperglycaemia, oxidative stress, inflammatory mediators, and organ-specific damage. Improvements in antioxidant enzymes (SOD, catalase, glutathione peroxidase), insulin sensitivity indices, and histopathological architecture collectively support the biological plausibility of the observed clinical benefits.

Preclinical Evidence and Effect on Metabolic Axis

Across preclinical models, *Shilajatu* demonstrated significant improvements in glycaemic control, insulin sensitivity, and lipid metabolism, indicating simultaneous regulation of glucose and energy pathways. In alloxan-induced diabetic rats, administration of *Shilajitu* at varying doses (50-200 mg/kg) produced significant reductions in fasting blood glucose, with the 100 mg/kg dose showing maximal efficacy (Trivedi *et al.*, 2004). Further, various studies showed significant reductions in fasting blood glucose, insulin levels, and HOMA-IR, with efficacy comparable to standard antidiabetic agents at higher doses. Earlier investigations further reported potentiation of insulin-mediated anti-hyperglycaemic action and, in some models, prevention of diabetes onset, suggesting preservation of pancreatic β-cell integrity and function with enhancement of peripheral glucose utilization (Al-Shudiefat & Alzyoud, 2024). These effects are mechanistically plausible given the presence of bioactive constituents such as fulvic acid and dibenzo-α-pyrones, which have been implicated in mitochondrial bioenergetics, electron transport efficiency, and cellular ATP generation (Bhattacharyya *et al.*, 2009; Carrasco-Gallardo *et al.*, 2012). In parallel, Shilajatu modulated dyslipidaemia by reducing triglycerides, LDL, and VLDL while increasing HDL, thereby targeting insulin resistance-associated lipid abnormalities that are not consistently corrected by conventional antidiabetic drugs (Gieroba *et al.*, 2025). Additionally, combinations of Shilajatu with standard antidiabetic agents, such as glibenclamide or metformin, have been found to further enhance glycaemic control and lipid modulation, suggesting potential additive or synergistic interactions with conventional therapies (Argaez-Lopez *et al.*, 2003).

Oxidative Axis

Oxidative stress is a critical central driver of β-cell dysfunction, insulin resistance, and diabetes-related complications (Bhatti *et al.*, 2022). Across experimental studies, *Shilajatu* exhibited potent antioxidant and anti-glycation activity, reflected by restoration of endogenous antioxidant enzymes, attenuation of lipid peroxidation, and suppression of haemoglobin glycation (Chen *et al.*, 2024; Giri *et al.*, 2018). Protection of pancreatic islets through enhanced antioxidant defences suggests a disease-modifying rather than purely symptomatic mechanism. Importantly, unlike many conventional antidiabetic agents that reduce oxidative stress indirectly via glycaemic improvement, it appears to exert intrinsic redox-modulatory effects (Buczynska *et al.*, 2024), thereby conferring broader cytoprotective benefits across metabolically active tissues.

Endocrine and Inflammatory Axis

Chronic inflammation and aberrant cytokine signalling are recognised contributors to insulin resistance and β-cell dysfunction (Venkatesan *et al.*, 2025). Evidence also supports its role in modulating inflammatory and endocrine pathways associated with diabetes. Experimental studies reported reductions in pro-inflammatory cytokines (Ghezelbash *et al.*, 2022) and downregulation of inducible nitric oxide synthase expression in pancreatic tissue, indicating attenuation of inflammatory stress on insulin-producing cells (Ghaazi Firozsalari *et al.*, 2018). This anti-inflammatory action likely complements metabolic and antioxidant effects by preserving

Table 2: Characteristics of Included studies.

Author/ year	Title	Activity	Measurable parameters	Study results
Rajpoot A, Pandey AK, Roy VK, Mishra RK. 2025. Andrologia. 2025(1).	*Shilajit* Mitigates Diabetes-Induced Testicular Dysfunction in Mice: A Modulation in Insulin Sensitivity, Germ Cell-Junctional Dynamics, and Oxido-Apoptotic Status.	Enhanced insulin sensitivity Anti-diabetic Antioxidant Spermatogenesis and Steroidogenesis Germ cell dynamics modulation.	Blood glucose and insulin levels Insulin sensitivity and HOMA-IR measurement. Sperm motility, morphology, viability, and concentration. Daily Sperm Production (DSP). Germ cell dynamics. Testicular & epididymal histopathology. Proliferating Cell Nuclear Antigen (PCNA) immunohistochemistry. Lipid Peroxidation (LPO), Superoxide Dismutase (SOD), and catalase activity. Serum testosterone and estradiol levels. Steroidogenic markers (SF-1, StAR, CYP11A1, 3β-HSD, 17β-HSD, CYP19) expression. Apoptotic markers (Bax, Bcl-2, Caspase-3, Bax: Bcl-2 ratio) expression. Blood-Testis Barrier (BTB) markers (ZO-1, Connexin-43, N-Cadherin, β-catenin) expression.	*Shilajit* treatment significantly lowered fasting blood glucose and insulin levels, and HOMA-IR, while increasing insulin sensitivity in diabetic mice, comparable to Empagliflozin at higher doses. *Shilajit* treatment significantly improved sperm count, motility, viability, and morphology in the cauda epididymis of diabetic animals, and significantly raised Daily Sperm Production (DSP). *Shilajit* markedly increased 1C germ cell populations and 1C:2C, 4C:S-Ph, and 1C:4C germ cell ratios in diabetic mice. *Shilajit* significantly improved Germinal Epithelium Height (GEH), decreased affected Seminiferous Tubules (ST), and increased ST Diameter (STD) in diabetic mice. *Shilajit* treatment significantly increased serum testosterone levels, expression of SF-1, StAR, and 17β-HSD, and significantly decreased CYP-19 expression in diabetic mice.
Reddy KS, Sudheer A, Pradeepkumar B, Reddy CS. 2019. Indian Journal of Pharmacology. 51(5).	Effect of a polyherbal formulation in streptozotocin-induced diabetic nephropathy in Wistar rats.	Antidiabetic Anti-inflammatory Antihyperlipidemic Antioxidant Nephroprotective.	Lipid profile (triglycerides, total cholesterol, very low-density lipoprotein, LDL, high-density lipoprotein). Renal function parameters (serum creatinine, urinary protein, urinary albumin excretion rate, type IV collagen excretion, urine volume, urinary urea, urine creatinine). Inflammatory markers (interleukin-6, transforming growth factor-β, tumor necrosis factor-alpha). Advanced Glycation End Products (AGES). Microscopic changes in kidney (histopathology).	PHF significantly reduced triglycerides, total cholesterol, VLDL, LDL, serum creatinine, urinary protein, urinary albumin excretion rate, advanced glycation end products, type IV collagen excretion, IL-6, TGF-β1, and TNF-α in STZ-DN rats while increasing HDL in STZ-DN rats. PHF significantly decreased serum creatinine, protein in urine, UAER, AGES, and type IV collagen excretion. PHF significantly reduced IL-6, TGF-β1, and TNF-α levels in STZ-DN rats. Histopathological examination showed PHF prohibited kidney damage, restoring normal glomerular architecture and normal architecture of tubules and glomeruli.

Author/ year	Title	Activity	Measurable parameters	Study results
Gupta V, Keshari BB, Tiwari SK, Murthy KN. 2016. AYU. 37(2).	A comparative study of *Shilajatu* and *Asanadi Ghana Vati* in the management of *Madhumeha* w.s.r. to type-2 diabetes mellitus.	Antidiabetic Antihyperlipidemic Antioxidant.	Clinical symptoms: polyuria, polydipsia, polyphagia, general weakness. FBS, PPBS, glycosylated haemoglobin, and lipid profile.	*Shilajatu* (Group A) showed statistically significant relief in all symptoms, with specific relief percentages including 79.62% for polyuria, 74.48% for polyphagia, 80.76% for polydipsia, and 92.85% for loss of libido. *Asanadi Ghana Vati* (Group B) also provided statistically significant relief in all symptoms, with specific relief percentages including 69.03% for polyuria, 70.34% for polyphagia, 77.44% for polydipsia, and 94.33% for cramps. In Group A, FBS reduced by 24.01% and PPBS by 20.23% ($p<0.001$). In Group B, FBS reduced by 26.03% and PPBS by 19.29% (P<0.001). *Shilajatu* provided overall more relief in symptoms compared to *Asanadi Ghana Vati*. *Shilajatu* showed a slightly greater reduction in Postprandial Blood Sugar (PPBS). No adverse effects were reported for either treatment during the 3-month clinical trial.
Patel DV, Chandola H, Baghel MS, Joshi JR. 2012. AYU. 33(2).	Clinical efficacy of *Shankhapushpi* and a herbo-mineral compound in type-II diabetes.	Anti-hyperglycaemic Antidiabetic Cognitive Rejuvenation Psycho-stimulant Antioxidant and immunomodulatory.	BPRS parameters Lipid profile Kidney Function Test Routine haematological investigations. Blood glucose levels (FBS, PPBS, urine sugar).	Group B (Herbo-mineral compound + *Shankhapushpi*) showed significantly better overall relief (71.13%) compared to Group A (HMC only) (60.52%). Group B demonstrated superior improvement in psychological parameters like disturbed *Manasabhava* (29.16% vs. 8.27% in Group A) and Brief Psychiatry Rating Scale (BPRS) (38.28% vs. 14.59% in Group A). Fasting blood sugar (18.04%) and postprandial blood sugar (27.75%) reduction was more pronounced in Group B compared to Group A (4.05% and 9.95% respectively) In BPRS parameters, Group A showed 14.59% relief, and Group B showed 38.28% relief. The overall therapeutic efficacy was significantly better in Group B ($x^2 = 15.50$) compared to Group A, with more patients showing marked or moderate improvement.

Author/ year	Title	Activity	Measurable parameters	Study results
Singh RH, Chansouria JP. 1996. Ancient Science of Life. 16(2).	Hypoglycaemic Property of *Shilajeet* and *Yashada Bhasma.*	Hypo-glycaemic	FBS	Both *Yashada Bhasma* and *Shilajatu* demonstrated hypoglycaemic activity in rats. *Yashada Bhasma* significantly reduced fasting blood glucose levels in pretreated alloxanized rats ($p < 0.05$). *Shilajatu* exhibited significant hypoglycaemic activity in normal rats ($p<.05$). *Shilajatu* decreased blood sugar levels in pretreated alloxanized rats. Hypoglycaemic activity was comparatively milder in *Shilajatu*-treated rats than in *Yashada bhasma*-treated rats.
Bhattacharya SK. 1995. Phytotherapy Research. 9(1).	*Shilajit* Attenuates Streptozotocin Induced Diabetes Mellitus and Decrease in Pancreatic Islet Superoxide Dismutase Activity in Rats.	Anti-hyperglycaemic Antidiabetic Enhanced Superoxide dismutase, catalase, and glutathione peroxidase activity. Weight loss attenuation.	Body weight changes Blood sugar levels Superoxide Dismutase (SOD) activity in pancreatic islets.	*Shilajit* (50 and 100 mg/kg, p.o.) had no discernible per se effect on blood glucose levels in normal rats. *Shilajit* (50 and 100 mg/kg, p.o.) attenuated the hyperglycaemic response of STZ from day 14 onwards, with only the higher dose (100 mg/kg) being statistically significant. Both doses of *Shilajit* reduced the STZ-induced decrease in superoxide dismutase (SOD) activity from day 14 onwards, but the effect of the lower dose (50 mg/kg) was statistically insignificant. Shilajit attenuated the decrease in body weight in hyperglycaemic rats, although it had no per se effect on body weight in normal rats. The anti-hyperglycaemic effect of *Shilajit* (100 mg/kg, p.o.) was evident on days 14, 21 and 28, and it significantly attenuated the decrease in SOD concentrations induced by STZ.

β-cell viability and insulin secretory capacity. Additionally, Shilajatu improved diabetes-associated endocrine disturbances, including hypogonadism in male diabetic rat models by significantly increasing serum testosterone levels and upregulating steroidogenic gene expression while suppressing excess aromatase activity (Mishra *et al.*, 2018; Pandit *et al.*, 2016) highlighting its broader endocrine-stabilizing potential.

Clinical Translation

Clinical studies, though comparatively limited in scale, corroborate experimental findings and provide supportive evidence of *Shilajatu* antidiabetic potential. Reported outcomes include significant reductions in fasting and postprandial glucose, glycosylated Haemoglobin (HbA_{1c}), improvements in subjective symptoms and quality of life indices (Pandey *et al.*, 2013; Singh *et al.*, 2025).

Safety and Translational Considerations

Evidence from both preclinical and clinical observations suggests that *Shilajatu* is generally well tolerated within therapeutic dose ranges with no significant adverse effects on liver, renal, or cardiovascular parameters (Iqbal *et al.*, 2025). However, caution is advised when combining Shilajatu with conventional antidiabetic

medications, as augmented glucose-lowering may predispose to hypoglycaemia if glycaemic monitoring is insufficient.

Other Pharmacological Effects of *Shilajatu*: Mechanistic Links with Diabetes Mellitus

From a mechanistic standpoint, the anti-obesity and anti-dyslipidaemic actions of *Shilajatu* appear to be closely interconnected with its antidiabetic potential. Obesity-associated insulin resistance is driven by adipose tissue dysfunction, ectopic lipid accumulation, chronic low-grade inflammation, and altered adipokine signalling (Rabiee *et al*., 2025). Experimental and clinical observations indicate that *Shilajatu* improves lipid homeostasis by reducing circulating triglycerides, LDL, and total cholesterol while increasing HDL levels, thereby mitigating lipotoxicity-induced impairment of insulin signalling pathways. Reduction in dyslipidaemia may alleviate oxidative stress and the inflammatory burden in pancreatic β-cells and peripheral tissues, thereby enhancing insulin sensitivity and glucose uptake, particularly in skeletal muscle (Berbudi *et al*., 2025). Additionally, improved muscle strength and endurance reported with *Shilajatu* supplementation may have direct metabolic relevance, as skeletal muscle accounts for the majority of post-prandial glucose disposal (Merz & Thurmond, 2020). Preservation of muscle mass and mitochondrial efficiency can therefore translate into improved peripheral insulin responsiveness and reduced progression of insulin resistance (Crescenzo *et al*., 2015).

Furthermore, *Shilajatu* exhibits potent antioxidant, adaptogenic, immunomodulatory, and neurocognitive effects that mechanistically intersect with the pathogenesis of diabetes and its complications. Oxidative stress and chronic inflammation play a central role in β-cell dysfunction, insulin resistance, endothelial injury, and the development of micro- and macro-vascular diabetic complications. By enhancing endogenous antioxidant defences, such as superoxide dismutase, catalase, and glutathione-dependent systems, *Shilajatu* may counteract reactive oxygen species-mediated cellular damage and preserve metabolic homeostasis. Its immunomodulatory actions, reflected in the downregulation of pro-inflammatory cytokines, may further attenuate inflammation-induced insulin resistance. Cognitive and adaptogenic effects are also mechanistically relevant, as psychological stress, cognitive impairment, and altered neuroendocrine responses adversely influence glycaemic control and treatment adherence in chronic diabetes. By improving stress adaptability, cognitive function, and overall vitality, *Shilajatu* may indirectly support better metabolic regulation and quality of life, reinforcing its role as a *Rasayana* that targets not only hyperglycaemia but also the upstream drivers and downstream consequences of diabetes mellitus.

IMPLICATIONS AND FUTURE DIRECTIONS

The convergence of outcomes across independent experimental and clinical studies suggests credible pharmacological activity, but several limitations like small sample size constrain definitive

Table 3: Characteristics and key outcomes of included clinical studies evaluating Shilajatu-based interventions in diabetes mellitus.

Sl. No.	Author	Population	Intervention	Comparator	Outcome
1.	Singh R, Yadav P, Patel A, Prajapati PK. 2025.	The patient was a 40-year-old North Indian male, diagnosed with Type 2 Diabetes Mellitus (T2DM) and weight loss.	*Shilajatu Darvi Yoga* (SDY), consisted of 1 g of *Shuddha Shilajatu (Asphaltum punjabinum)* dissolved in 10 mL concentrated decoction of *Daruharidra* (*Berberis aristata* DC.) The patient was advised to take 5 mL of SDY twice daily with lukewarm water on an empty stomach, preferably 1 hr before meals for 90 days.	Not applicable	Significant improvement in clinical symptoms and biochemical parameters observed. HbA_{1c} decreased from 12.8 to 7.3. Fasting blood sugar decreased from 224 to 122. Postprandial blood sugar decreased from 437 to 149 [1]. Quality of life significantly enhanced from 67 to 142 Reduction in FBS (102 mg/dL), PPBS (288 mg/dL), HbA_{1c} (5.5 points), and lipid profile (total cholesterol: 27 mg/dL, LDL: 20 mg/dL). Positive improvement in CBC, LFT (SGPT: 21 mg/dL, ALP: 42 mg/dL), and KFT (serum urea: 4.5 mg/dL).

Sl. No.	Author	Population	Intervention	Comparator	Outcome
2.	Gupta V, Keshari BB, Tiwari SK, Murthy KN. 2016.	90 patients with classical signs and symptoms of *Madhumeha* (type-2 diabetes mellitus). Patients were randomly divided into two groups: Group A (40 cases) and Group B (40 cases). Patients between 30 and 80 years. Patients having complication of diabetic neuropathy.	Group A received cap. *Shilajatu* (500 mg twice daily) for 3 months. Group B received *Asanadi Ghana Vati* (2 Vati twice daily) for 3 months.	Asanadi Ghana Vati	*Shilajatu* (Group A) showed statistically significant relief in all symptoms, with specific relief percentages including 79.62% for polyuria, 74.48% for polyphagia, 80.76% for polydipsia, and 92.85% for loss of libido. *Asanadi Ghana Vati* (Group B) also provided statistically significant relief in all symptoms. In Group A, FBS reduced by 24.01% and PPBS by 20.23% ($p<0.001$). In Group B, FBS reduced by 26.03% and PPBS by 19.29% ($p<0.001$).
3.	Patel DV, Chandola H, Baghel MS, Joshi JR. 2012.	The study included a total of 93 patients with type-II diabetes and with classical signs and symptoms of *Madhumeha.* Group A consisted of 48 patients, with 34 completing the treatment. Group B consisted of 45 patients, with 34 completing the therapy.	Group A received a Herbo-Mineral Compound (HMC) containing *Shuddha Shilajatu, Shuddha Guggulu, Vijayasara Ghana, Saptarangi Ghana*, and *Triphala Ghana.* It was administered at 3 gm/day in three divided doses with lukewarm water before meals for 8 weeks. Group B received the same HMC as Group A, but also included *Medhya Rasayana* (MR)-*Shankhapushpi* at 1.5 gm/day in three divided doses for 8 weeks.	*Shankhapushpi* Powder	Group B (Herbo-mineral compound+ *Shankhapushpi*) showed significantly better overall relief (71.13%) compared to Group A (HMC only) (60.52%). Group B demonstrated superior improvement in psychological parameters like disturbed *Manasabhava* (29.16% vs. 8.27% in Group A) and Brief Psychiatry Rating Scale (BPRS) (38.28% vs. 14.59% in Group A). FBS(18.04%) PPBS(27.75%) reduction was more in Group B compared to Group A (4.05% and 9.95% respectively). The combined therapy in Group B showed a highly significant overall effect ($x^2=15.50$), indicating it was more effective than HMC alone.

Figure 2: Probable mode of action of Shilajatu.

conclusions. In keeping with scoping review methodology, this review did not undertake a formal risk-of-bias assessment or a quantitative meta-analysis. Preclinical studies exhibit substantial heterogeneity in experimental models, dosing regimens, and outcome measures, limiting cross-study comparability. Clinical evidence, while supportive, is characterised by limited sample sizes, variability in formulations and treatment protocols and a lack of rigorously controlled study designs.

Future investigations should prioritise well-designed randomised controlled trials, employing standardised *Shilajatu* preparations, extended treatment durations, clinically relevant endpoints and longer follow-up periods. Evaluation of additive or synergistic effects alongside standard antidiabetic therapy will be particularly important to define its translational utility. In parallel, mechanistic studies comprising molecular, cellular, and systems pharmacology approaches are required to delineate the pathways underlying its multi-targeted actions.

CONCLUSION

Overall, the available preclinical and clinical evidence suggests that *Shilajatu* holds significant potential as a therapeutic intervention for diabetes mellitus, exerting multidimensional effects on glycaemic regulation, lipid metabolism, insulin sensitivity, and systemic oxidative-inflammatory balance. Findings from *in vivo* models consistently demonstrate attenuation of hyperglycaemia, improvement in antioxidant defence systems, modulation of inflammatory mediators, and protection against diabetes-associated organ damage (Figure 2).

Clinical studies, though limited in number and methodological heterogeneity, further support these observations by reporting meaningful reductions in fasting and postprandial blood glucose levels, improvements in lipid profiles, alleviation of classical diabetic symptoms, and enhancements in quality-of-life parameters.

Despite these encouraging outcomes, the current body of evidence remains constrained by small sample sizes, variability in formulations, dosing regimens, and outcome measures, as well as a relative paucity of long-term, well-designed randomised controlled trials. Moreover, mechanistic insights derived from preclinical models have yet to be systematically translated into clinical contexts, underscoring the need for robust translational research that integrates pharmacological, molecular, and clinical endpoints. Future investigations should prioritise standardised *Shilajatu* preparations with defined phytochemical and mineral profiles, employ validated metabolic and inflammatory biomarkers, and assess long-term safety alongside efficacy. Such

rigorously designed studies will be essential to clarify therapeutic positioning, optimise dosage strategies, and establish *Shilajatu*'s role within integrative diabetes management frameworks, thereby bridging traditional *Rasayana* concepts with contemporary evidence-based medicine.

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ABBREVIATIONS

AGES: Advanced Glycation End Products; **ALP:** Alkaline Phosphatase; **ATP:** Adenosine triphosphate; **AYUSH:** Ayurveda, Yoga, and Naturopathy, Unani, Siddha and Homoeopathy; **3β-HSD:** 3-Beta-Hydroxysteroid Dehydrogenase; **17β-HSD:** 17-Beta-Hydroxysteroid Dehydrogenase; **Bax:** Bcl-2-associated X protein; **Bcl-2:** B-cell lymphoma 2; **BPRS:** Brief Psychiatry Rating Scale; **BTB:** Blood-Testis Barrier; **CBC:** Complete Blood Count; **CYP11A1:** Cytochrome P450 Family 11 Subfamily A Member 1; **CYP19:** Cytochrome P450 Family 19; **DSP:** Daily Sperm Production; **FBS:** Fasting Blood Sugar; **GEH:** Germinal Epithelium Height; **HbA_{1c}:** Glycosylated Haemoglobin; **HDL:** High-Density Lipoprotein; **HMC:** Herbo Mineral Compound; **HOMA-IR:** Homeostatic Model Assessment of Insulin Resistance; **IL-6:** Interleukin-6; **KFT:** Kidney Function Test; **LDL:** Low-Density Lipoprotein; **LFT:** Liver Function Test; **LPO:** Lipid peroxidation; **MEDLINE:** Medical Literature On-Line; **MR:** Medhya Rasayana; **PCNA:** Proliferating Cell Nuclear Antigen; **PHF:** Polyherbal Formulation; **PICOS:** Population, Intervention, Comparison, Outcome and Study Design; **PICOT:** Population, Intervention, Concept, Outcome, and Time; **PPBS:** Postprandial Blood Sugar; **PRISMA-ScR:** Preferred Reporting Items for Systematic Reviews and Meta-Analyses Extension for Scoping Reviews; **PubMed:** Publication database connected to Medline; **QOL:** Quality of Life; **SGPT:** Serum Glutamic Pyruvic Transaminase; **SDY:** Shilajatu Darvi Yoga; **SOD:** Superoxide Dismutase; **ST:** Seminiferous Tubules; **STD:** Seminiferous Tubules Diameter; **StAR:** Steroidogenic Acute Regulatory protein; **STZ:** Streptozotocin; **SF-1:** Steroidogenic Factor 1; **T2DM:** Type 2 Diabetes Mellitus; **TGF-β1:** Transforming Growth Factor beta-1; **TNF-α:** Tumour Necrosis Factor-alpha; **UAER:** Urinary Albumin Excretion Rate; **VLDL:** Very Low-Density Lipoprotein; **ZO-1:** Zonula occludens-1.

CONFLICT OF INTEREST

The authors declare that there is no conflict of interest.

AUTHOR'S CONTRIBUTION

Anjali Upadhyay: Research concept and design, Collection and/or assembly of data & Writing the article; **Rohit Singh:** Collection and assembly of data, Data analysis, Interpretation & Writing the article; **Debajyoti Chakraborty:** Research concept and design, Data analysis & Writing the article; **Vijay Kumar:** Data interpretation & Critical revision of the article; **Pramod Yadav:** Research concept and design, Data interpretation & Critical revision of the article; **Galib Ruknuddin:** Data analysis, Critical revision of the article & Final approval of the article.

SUMMARY

Shilajatu (*Asphaltum punjabinum*), a herbo-mineral exudate traditionally classified as a *Rasayana* in Ayurveda, is indicated for the management of *Prameha* (diabetes mellitus). This scoping review, conducted according to PRISMA-ScR guidelines and synthesized evidence from seven studies, comprising four *in vivo* models, two clinical trials, and one case report which were identified from a search of 152 records spanning 1980 to 2025. The findings indicate that Shilajatu exerts multimodal antidiabetic effects by coordinating Metabolic, Oxidative, and Inflammatory pathways. Preclinical evidence demonstrated significant attenuation of hyperglycaemia, improved insulin sensitivity (reduced HOMA-IR), and the restoration of key antioxidant enzymes such as Superoxide Dismutase (SOD), catalase, and glutathione peroxidase. Clinical investigations further supported these results, reporting reductions in fasting blood glucose by 18.04-26.03% and postprandial glucose by 19.29-27.75% over 8-12 weeks. Additionally, a notable case report documented a reduction in HbA_{1c} from 12.8% to 7.3% over 90 days. Beyond glycaemic control, *Shilajatu* improved lipid parameters and provided substantial relief from classical diabetic symptoms, including polyuria and polydipsia and improved quality of life as well. While the current evidence base is promising and reflects the significant anti-diabetic potential of *Shilajatu*, the review concludes that larger randomized controlled trials with standardized preparations are necessary to establish definitive clinical efficacy and translational relevance.

REFERENCES

Al-Shudiefat, A. A., & Alzyoud, J. A. (2024). Shilajit (Mumie) A natural product with antihyperglycemic, anti-obesity, anti-oxidant, and anti-inflammatory properties for a potential treatment of diabetes mellitus. *Jordan Journal of Biological Sciences, 17*(1).

Argáez-López, N., Wacher, N. H., Kumate-Rodríguez, J., Cruz, M., Talavera, J., Rivera-Arce, E., & Lozoya, X. (2003). The use of complementary and alternative medicine therapies in type 2 diabetic patients in Mexico. *Diabetes Care, 26*(8), 2470-2471.

Arksey, H., & O'Malley, L. (2005). Scoping studies: Towards a methodological framework. *International Journal of Social Research Methodology, 8*(1), 19-32.

Berbudi, A., Khairani, S., & Tjahjadi, A. I. (2025). Interplay between insulin resistance and immune dysregulation in type 2 diabetes mellitus: Implications for therapeutic interventions. *Immunotargets and Therapy, 14*, 359-382.

Bhattacharyya, S., Pal, D., Banerjee, D., Auddy, B., Gupta, A. K., Ganguly, P., Majumder, U. K., & Ghosal, S. (2009). Shilajit dibenzo-α-pyrones: Mitochondria targeted antioxidants. *Pharmacologyonline, 2*, 690-698.

Bhatti, J. S., Sehrawat, A., Mishra, J., Sidhu, I. S., Navik, U., Khullar, N., Kumar, S., Bhatti, G. K., & Reddy, P. H. (2022). Oxidative stress in the pathophysiology of type 2 diabetes and related complications: Current therapeutics strategies and future perspectives. *Free Radical Biology and Medicine, 184*, 114-134.

Buczynska, A., Sidorkiewicz, I., Krętowski, A. J., & Adamska, A. (2024). Examining the clinical relevance of metformin as an antioxidant intervention. *Frontiers in Pharmacology, 15*, 1330797.

Carrasco-Gallardo, C., Guzmán, L., & Maccioni, R. B. (2012). Shilajit: A natural phytocomplex with potential procognitive activity. *International Journal of Alzheimer's Disease, 2012*, Article 674142.

Chen, Y., Meng, Z., Li, Y., Liu, S., Hu, P., & Luo, E. (2024). Advanced glycation end products and reactive oxygen species: Uncovering the potential role of ferroptosis in diabetic complications. *Molecular Medicine, 30*(1), 141.

Crescenzo, R., Bianco, F., Mazzoli, A., Giacco, A., Liverini, G., & Iossa, S. (2015). Mitochondrial efficiency and insulin resistance. *Frontiers in Physiology, 5*, 512.

Danielle, H. C. L., & O'Brien, K. K. (2012). *Scoping studies: Advancing the methodology. Representing and intervening* (pp. 1-18). Cambridge University Press.

Ghaazi Firozsalari, F., Shahrokhi, N., Khaksari Hadad, M., Asadikaram, G., & Atashbar, J. (2018). Effect of Shilajit on the levels of pro-inflammatory and anti-inflammation cytokines in hepatic injury in male rats. *Journal of Mazandaran University of Medical Sciences, 28*(159), 1-3.

Ghezelbash, B., Shahrokhi, N., Khaksari, M., Asadikaram, G., Shahrokhi, M., & Shirazpour, S. (2022). Protective roles of Shilajit in modulating resistin, adiponectin, and cytokines in rats with non-alcoholic fatty liver disease. *Chinese Journal of Integrative Medicine, 28*(6), 531-537.

Ghosal, S., Reddy, J. P., & Lal, V. K. (1976). Shilajit I: Chemical constituents. *Journal of Pharmaceutical Sciences, 65*(5), 772-773.

Gieroba, B., Kryska, A., & Sroka-Bartnicka, A. (2025). Type 2 diabetes mellitus-conventional therapies and future perspectives in innovative treatment. *Biochemistry and Biophysics Reports, 42*, 102037.

Giri, B., Dey, S., Das, T., Sarkar, M., Banerjee, J., & Dash, S. K. (2018). Chronic hyperglycaemia mediated physiological alteration and metabolic distortion leads to organ dysfunction, infection, cancer progression and other pathophysiological consequences: An update on glucose toxicity. *Biomedicine & Pharmacotherapy, 107*, 306-328.

Iqbal, A., Rehman, S. A., Khan, N., & Qadir, A. (2025). Asphaltum Punjabianum (Shilajit): Unraveling myths with scientific evidence. *International Journal of Ayurveda and Pharma Research*, 137-145.

Khanna, R., Witt, M., Khalid Anwer, M., Agarwal, S. P., & Koch, B. P. (2008). Spectroscopic characterization of fulvic acids extracted from the rock exudate Shilajit. *Organic Geochemistry, 39*(12), 1719-1724.

Kumar, S., Singh, G., Pandey, A. K., & Singh, R. H. (2014). A clinical study on the Naimittika Rasayana effect of Silajatu and Mamajjaka in type-2 Diabetes Mellitus. *AYU, 35*(4), 404-410.

Merz, K. E., & Thurmond, D. C. (2020). Role of skeletal muscle in insulin resistance and glucose uptake. *Comprehensive Physiology, 10*(3), 785-809.

Mishra, R. K., Jain, A., & Singh, S. K. (2018). Profertility effects of Shilajit on cadmium-induced infertility in male mice. *Andrologia, 50*, e13064.

Mittal, P., Kaushik, D., Gupta, V., Bansal, P., & Khokra, S. (2009). Therapeutic potential of "Shilajit Rasayana"- A review. *International Journal of Pharmaceutical and Clinical Research, 1*(2), 47-49.

Page, M. J., McKenzie, J. E., Bossuyt, P. M., Boutron, I., Hoffmann, T. C., *et al.* (2021). The PRISMA 2020 statement: An updated guideline for reporting systematic reviews. *BMJ, 372*, n71.

Pandey, G., Sharma, R., & Singh, R. H. (2013). Clinical evaluation of Shilajatu in the management of diabetes mellitus (Prameha). *AYU, 34*(4), 404-409.

Pandit, S., Biswas, S., Jana, U., De, R. K., Mukhopadhyay, S. C., & Biswas, T. K. (2016). Clinical evaluation of purified Shilajit on testosterone levels in healthy volunteers. *Andrologia, 48*(5), 570-575.

Rabiee, A., Hossain, M. A., & Poojari, A. (2025). Adipose tissue insulin resistance: A key driver of metabolic syndrome pathogenesis. *Biomedicines, 13*(10), 2376.

Shusruta Samhita. (2007). Dalhana commentary, Chikitsa Sthana, Sarvopaghata Shamaniya Adhyaya, 27/2. In V. J. T. Acharya (Ed.),(9th ed., p. 498). Chaukhambha Orientalia.

Singh, R., Yadav, P., Patel, A., & Prajapati, P. K. (2025). The synergy between Shilajatu (Asphaltum punjabinum) and Daruharidra (*Berberis aristata* DC.), curtails the glycaemic indicators and alleviates the symptoms of type 2 diabetes: A case report. *Journal of Medical Case Reports, 19*(1), 598.

Tricco, A. C., Lillie, E., Zarin, W., O'Brien, K. K., Colquhoun, H., *et al.* (2018). PRISMA extension for scoping reviews (PRISMA-ScR): Checklist and explanation. *Annals of Internal Medicine, 169*(7), 467-473.

Trivedi, N. A., Mazumdar, B., Bhatt, J. D., & Hemavathi, K. G. (2004). Effect of Shilajit on blood glucose and lipid profile in alloxan-induced diabetic rats. *Indian Journal of Pharmacology, 36*(6), 373-376.

Venkatesan, K., Paulsamy, P., Alqahtani, S., Asiri, Y. I., Alqahtani, T., Alqahtani, A., Sivadasan, D., Ahmed, R., Elfadil, H., Asseri, K. A., & Qureshi, A. A. (2025). An update on the role of inflammation in insulin resistance and islet β cell failure-A crosstalk between immune cells, adipose tissue, cytokines, and oxidative stress. *Letters in Drug Design & Discovery, 22*(3), 100023.

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