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# A COMPARATIVE STUDY OF HAND GRIP STRENGTH IN DIFFERENT DHATUSARA INDIVIDUALS: A CROSS-SECTIONAL STUDY IN DIABETIC VERSUS NON-DIABETIC POPULATIONS

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## ABSTRACT

Background & Objectives: Dhatu Sarata in Ayurveda represents the qualitative, structural, and functional excellence of the seven Dhatus (bodily tissues), serving as a biological marker for immune resilience (Bala), physical endurance, and functional capacity. Type 2 Diabetes Mellitus (Madhumeha) is a chronic metabolic disorder characterised by persistent hyperglycemia, metabolic disturbance, Dhatukshaya (tissue depletion), and progressive muscular weakness. Hand grip strength (HGS) measured via a standard Jamar dynamometer serves as an objective clinical indicator of peripheral muscle strength and musculoskeletal function. This cross-sectional observational study evaluated and compared hand grip strength across different Dhatu-Sara categories in diabetic (Type 2 Diabetes Mellitus) versus non-diabetic individuals. Methods: A total of 200 participants (100 Type 2 Diabetic patients and 100 age- and gender-matched Non-Diabetic healthy controls) aged 30–60 years were recruited from the Faculty of Ayurveda Hospital, Tantia University, Sri Ganganagar, Rajasthan. Detailed Dhatu Sarata examination was performed using standardized classical Ayurvedic Lakshana criteria (Murta and Amurta Lakshanas) to categorize subjects into Sarata types (predominantly Mamsa Sara, Asthi Sara, Meda Sara, Rasa Sara, Rakta Sara, Majja Sara, Shukra Sara, and Asara/Alpa Sara). Isometric hand grip strength (in kilograms) was measured in both dominant and non-dominant hands using a calibrated handheld digital dynamometer following standard ASHT protocols. Results: Non-diabetic individuals demonstrated

significantly higher mean hand grip strength compared to diabetic patients across both dominant (34.82 ± 5.64 kg vs. 27.41 ± 4.92 kg; $p < 0.001$) and non-dominant hands (32.15 ± 5.10 kg vs. 25.18 ± 4.45 kg; $p < 0.001$). Subgroup analysis revealed that individuals classified as Mamsa Sara and Asthi Sara exhibited maximum hand grip strength values in both groups, whereas Meda Sara and Asara/Alpa Sara individuals exhibited significantly reduced muscular strength. Furthermore, diabetic patients belonging to Meda Sara and Asara categories exhibited the most pronounced muscle strength impairment, reflecting severe Dhatukshaya and Dhatvagnimandya. Conclusion: Hand grip strength varies significantly across Dhatu-Sara categories and is substantially reduced in Type 2 Diabetes Mellitus patients. Assessment of Dhatu Sarata provides valuable prognostic insights into muscular functional capacity, supporting early identification of sarcopenic risk and personalized therapeutic interventions in diabetic management.

**KEYWORDS:** Dhatu Sarata, Hand Grip Strength, Madhumeha, Type 2 Diabetes Mellitus, Mamsa Sara, Asthi Sara, Rachana Sharir.

## 1. INTRODUCTION

Prameha is a term from Ayurvedic texts that covers a range of health issues mainly linked to changes in how urine is produced and passed. These issues include going to the bathroom more often than usual, passing a large amount of urine, and having urine that looks cloudy or unusual in some way. In this context, Madhumeha is explained as being related to the increase and imbalance of Vata and Kapha Doshas, along with the involvement of Meda (fat tissue) and other Dhatus, and Ojas is also mentioned as one of the affected Dushyas. These harmful changes eventually show up and become noticeable in the Mutravaha Srotas. From today's medical view, Madhumeha is usually linked to Type 2 Diabetes Mellitus (T2DM). Ramchandran A (2012) explains that Diabetes Mellitus (DM) is a group of metabolic diseases where blood glucose levels remain high over time because of problems in how the body processes carbohydrates, fats, and proteins. The condition can happen because the body isn't making enough insulin, or it isn't using insulin properly, or both.It shows up with symptoms like needing to urinate a lot, feeling very thirsty, eating more than usual, losing weight, and feeling weak all over.Ayurvedic treatment for Madhumeha, which is similar to Diabetes Mellitus, is one of the traditional healing methods mentioned in the wider category of Prameha. Prameha disorders are mainly linked to problems with how urine is produced and the amount of urine passed, which happens when the body's Doshas are disrupted.Classical

descriptions say that poor eating habits and not getting enough exercise are key factors that help cause the disease. Eating foods that have Ushna, Snigdha, and Guru qualities on a regular basis is thought to be especially helpful.Foods like fish, curd, and freshly harvested grains are specifically mentioned as possible causes So, foods and substances that make Kapha worse, cause Meda to build up, and lead to more urine are seen as major causes of Prameha. The word Prameha or Madhumeha comes from "Pra," which means a lot or too much, and "Meha," which refers to urination.This means the term describes a condition where there is a lot of urine being passed, and the way the body excretes urine is different from normal. Classical descriptions also include signs like sweating a lot, bad body smell, loose or floppy body, liking to sit, lie down, and sleep a lot, not moving much, feeling heavy or blocked in the area around the heart, unusual secretions from the eyes, tongue, and ears, being very overweight, fast-growing hair and nails, preferring cold things, dry throat and mouth, a sweet taste in the mouth, a burning feeling in the hands and feet, and ants being attracted to the urine. These features are mentioned in the Purvaroopas, which are the early forms of Prameha. The World Health Organization says that Diabetes Mellitus is a big problem for health around the world. Type 2 Diabetes Mellitus has seen a much bigger rise in how common it is around the world compared to Type 1 Diabetes Mellitus. This expansion is closely linked to urbanization, people sitting more, rising obesity rates, changes in diet, and other changes in how people live. In India, about 11.3% of people have diabetes, and more than 95% of those who have it are diagnosed with type 2 diabetes. Keeping blood sugar too high for a long time can cause damage to small and large blood vessels, slow down how the body heals tissues, and lead to a gradual loss of muscle mass and strength in the body. In Ayurvedic body science and structure, Dhatu Sarata refers to the good quality, clean structure, and proper working of the body's tissues called Dhatus. The seven physical Dhatus—Rasa (plasma or chyle), Rakta (blood cells), Mamsa (muscle tissue), Meda (fat tissue), Asthi (bone tissue), Majja (bone marrow or nervous tissue), and Shukra (reproductive tissue)—along with Satva (mental essence)—form the basic structure of the human body.Sarata Pariksha is a key tool used to assess a person's real physical strength, their body's reserve of tissues, and how well their body functions.It was described by Acharya Charaka in Vimanasthana 8 and by Acharya Sushruta in Sutrasthana 35. A person who shows exceptional quality in a specific Dhatu is called a Sara Purusha related to that tissue. In these people, the processes of digestion, selective tissue differentiation, and tissue growth all work very efficiently. Mamsa Sarata has strong, firm, and tightly packed muscles, steady joints, and great stamina. Asthi Sarata has strong bones, hard teeth, big structures, and a solid build. On the other hand, people who have

Meda Sarata or Asara (Alpa Sara) conditions tend to have loose skin, less muscle, and lower ability to handle physical activity. Skeletal muscle strength is very important for showing how healthy someone is, how well they can do everyday tasks, and how their body uses energy overall. Hand grip strength, measured using a standard dynamometer, is a widely accepted, reliable, non-invasive method that objectively shows the force of the upper arm muscles and overall muscle mass in the skeleton. Classical Ayurvedic texts offer detailed ideas about Dhatu Sarata and how Madhumeha, a condition leading to Dhatukshaya and Daurbalya, affects the body. However, there is not much real-world clinical information available about muscle strength in different Dhatu-Sara groups when comparing diabetic and non-diabetic people. Research Question: Does hand grip strength differ a lot based on different types of Dhatu-Sara, and is this difference bigger between people who have Type 2 Diabetes Mellitus compared to those who don't have diabetes?

## 2. AIMS AND OBJECTIVES

### 2.1 AIM

To evaluate and compare hand grip strength across individuals belonging to different Dhatu Sara categories among diabetic and non-diabetic populations.

### 2.2 OBJECTIVES

1. To classify and determine the Dhatu-Sara status of study participants using standardized Ayurvedic diagnostic criteria (Murta and Amurta Lakshanas).
2. To measure and record isometric hand grip strength in dominant and non-dominant hands in both diabetic and non-diabetic groups.
3. To compare muscle strength (hand grip strength) among diabetic and non-diabetic individuals across different Sara categories.
4. To evaluate the association between tissue excellence (Dhatu Sarata) and muscular functional performance in metabolic disease states.

### 2.3 Hypotheses

- Null Hypothesis (H0): There is no significant association or difference in hand grip strength across specific Dhatu-Sara categories between diabetic and non-diabetic individuals.
- Alternative Hypothesis (H1): There is a significant association between hand grip strength and specific Dhatu-Sara categories, with non-diabetic individuals demonstrating

significantly higher grip strength than diabetic patients across Sarata groups.

## 3. HISTORICAL & LITERARY REVIEW

In Ayurvedic epistemology, Pramana represents an essential methodological framework for acquiring and establishing valid scientific knowledge. It encompasses Aptopadesha (authoritative classical testimony), Pratyaksha (direct clinical observation), and Anumana (logical inference). Review of classical literature reveals a rich historical evolution of Prameha and Madhumeha across different historical epochs:

- Vedic Period (5000 BC – 1500 BC): Ayurveda is recognized as an Upaveda of Atharvaveda. Rigveda mentions 'Mehanam' denoting urinary excretion. Atharvaveda describes Daivichikitsa for Udakmeha and Madhumeha.

- Puranic Period: Garuda Purana describes 'Madhuryacha Tanorata' and 20 varieties of Prameha, detailing Nidana, Chikitsa, and Upadrava. Agni Purana describes Kshaudrameha and Akshaudrameha.

- Epic Period: Ramayana (Ayodhya Kanda) describes King Dasharatha's debilitated state featuring pallor, weakness, and honey-like urine. Kautilya's Arthashastra mentions formulations inducing diabetic-like conditions.

- Samhita Period: Charaka Samhita (Sutrasthana 17, Nidanasthana 4, Chikitsasthana 6, Indriyasthana 5) details Madhumeha pathogenesis, classification, Arishta Lakshana, and management. Sushruta Samhita (Nidanasthana 6, Chikitsasthana 11-13) classifies Prameha into Sahaja (hereditary/lean) and Apathyanimittaja (acquired/obese). Ashtanga Hridaya and Ashtanga Sangraha describe Dhatukshayatmaka and Dosha Avritapatha mechanisms.

- Medieval Period: Madhava Nidana systematizes Nidana Panchaka. Chakradatta, Sharangadhara Samhita, Bhavaprakasha, Yogaratnakara, Bhaishajya Ratnavali, and Rasaratna Samucchaya describe diverse herbal, mineral, and Pathya-Apathya protocols.

### Samprapti (Pathophysiology) of Prameha & Madhumeha

The pathogenesis of Prameha involves the interaction of three Doshas (predominantly Kapha) with ten Dushyas: Rasa, Rakta, Mamsa, Meda, Vasa, Majja, Shukra, Oja, Lasika, and Kleda. Aggravated Kapha causes laxity of tissues (Sharira Shaithilya) and combines with Meda and Kleda. This vitiated fluid permeates the channels, causing Dhatvagnimandya (impaired tissue metabolism) and excessive waste elimination via Mutravaha Srotas.

Samprapti of Madhumeha occurs via two primary pathways: 1. Dhatukshayajanya Madhumeha: Primary tissue depletion due to excessive Ruksha/Laghu Ahara, severe stress, or genetic factors leads to Vata aggravation, which draws Ojas into urine. It corresponds to Type 1 Diabetes / lean Type 2 Diabetes. 2. Aavaranajanya Madhumeha: Overindulgence in heavy, fatty foods, sedentary lifestyle, and excessive sleep cause Kapha, Meda, and Mamsa accumulation, which obstructs the normal pathway of Vata (Margavarodha). Obstructed Vata subsequently damages tissue reserves, corresponding to classic Type 2 Diabetes Mellitus.

**Table 1: Samprapti Ghataka of Prameha / Madhumeha.**

| Pathological Factor (Ghataka) | Classical Ayurvedic Description |
|---|---|
| **Dosha** | Tridosha (Vata, Pitta, Kapha) — Dominant: Bahudrava Kapha & Vata |
| **Dushya** | Meda, Mamsa, Kleda, Rasa, Rakta, Vasa, Majja, Shukra, Oja, Sweda |
| **Srotas Involved** | Mutravaha, Medovaha, Udakavaha, Mamsavaha, Swedavaha, Rasavaha |
| **Srotodushti Type** | Atipravrutti (excessive flow) & Srotorodha / Margavarodha (obstruction) |
| **Agni Status** | Dhatvagnimandya (impaired tissue-level metabolic transformation) |
| **Udbhavasthana** | Amashaya (stomach / upper gastrointestinal tract) |
| **Adhisthana / Vyakti Sthana** | Basti (urinary bladder / renal system) & Mutravaha Srotas |
| **Marga** | Madhyama Marga (involving deeper tissue structures and vital organs) |
| **Swabhava & Prognosis** | Chirakari (chronic), Anushangi (recurrent); Kaphaja: Sadhya, Vataja: Asadhya |

## 4. MATERIALS AND METHODS

### 4.1 Study Design & Setting

This study was designed as a hospital-based cross-sectional observational comparative study. The research was conducted in the Department of Rachana Sharir, Faculty of Ayurveda, Tantia University, Sri Ganganagar, Rajasthan. Prior to study initiation, formal approval was obtained from the Institutional Ethical Committee (IEC Certificate No. TU/IEC/2024/08). Written informed consent was obtained from all voluntary participants prior to enrollment.

### 4.2 Selection of Participants & Sample Size

A total of 200 study participants aged between 30 and 60 years were enrolled and divided into two distinct study groups: • Group A (Diabetic Group): 100 established cases of Type 2 Diabetes Mellitus diagnosed as per standard WHO/ADA criteria (Fasting Plasma Glucose ≥

126 mg/dL and/or HbA1c ≥ 6.5%). • Group B (Non-Diabetic Control Group): 100 age- and gender-matched healthy individuals with normal glycemic status (Fasting Blood Glucose < 100 mg/dL and HbA1c < 5.7%).

### 4.3 Eligibility Criteria

Inclusion Criteria: 1. Individuals aged between 30 and 60 years of either gender. 2. Confirmed cases of Type 2 Diabetes Mellitus for Group A (duration > 1 year). 3. Healthy non-diabetic volunteers for Group B. 4. Willingness to participate and give written informed consent. Exclusion Criteria: 1.

Patients with Type 1 Diabetes Mellitus or secondary diabetes. 2. Subjects with severe neurological deficits, stroke, upper limb motor nerve injury, or active arthritis of hand joints. 3. Individuals with severe diabetic complications (end-stage renal disease, active foot ulceration, severe retinopathy). 4. Pregnant or lactating women. 5. Patients with chronic debilitating illnesses such as tuberculosis, malignancy, or congestive heart failure.

### 4.4 Assessment of Dhatu Sarata

Dhatu Sarata was evaluated using a structured, validated Ayurvedic Sarata Assessment Questionnaire based on classical Lakshanas described in Charaka Samhita Vimanasthana (Adhyaya 8) and Sushruta Samhita Sutrasthana (Adhyaya 35). Both Murta Lakshanas (observable physical/structural parameters including tissue firmness, skin texture, joint compactness, bone prominence) and Amurta Lakshanas (functional, psychological, and endurance attributes) were scored. Based on cumulative percentage scores, participants were classified into their predominant Dhatu-Sara category: Mamsa Sara, Asthi Sara, Meda Sara, Rasa Sara, Rakta Sara, Majja Sara, Shukra Sara, and Asara/Alpa Sara (individuals lacking marked excellence in any single Dhatu).

### 4.5 Measurement of Hand Grip Strength (HGS)

Isometric Hand Grip Strength was measured using a calibrated digital handheld dynamometer (Camry EH101) following standard American Society of Hand Therapists (ASHT) guidelines. The participant was seated comfortably in an upright chair with back support, shoulder adducted, elbow flexed at 90°, forearm in neutral position, and wrist slightly extended (0° to 30°). Participants were instructed to perform maximum voluntary exertion for 3 seconds. Three trials were recorded for both dominant and non-dominant hands, with a 60-second rest interval between attempts to prevent muscle fatigue. The maximum peak value

(in kilograms) was recorded for statistical analysis.

### 4.6 Statistical Analysis

Statistical analysis was executed using SPSS software (Version 26.0). Continuous demographic and functional data were expressed as Mean ± Standard Deviation (SD). Categorical variables were expressed as frequencies and percentages. Comparison of quantitative variables between diabetic and non-diabetic groups was performed using independent student's t-test. Comparison of hand grip strength across different Sara categories was conducted using One-Way Analysis of Variance (ANOVA) followed by post-hoc Tukey's test. A p-value of $< 0.05$ was considered statistically significant.

## 5. OBSERVATIONS AND RESULTS

The study population comprised 200 subjects equally distributed into Group A (Diabetic, n=100) and Group B (Non-Diabetic, n=100). Baseline demographic parameters including age, gender distribution, and anthropometric profiles were comparable across both groups, ensuring homogeneity.

**Table 2: Baseline Demographic Profile of Study Participants.**

| Demographic Parameter | Group A (Diabetic, n=100) | Group B (Non-Diabetic, n=100) | p-value |
|---|---|---|---|
| **Mean Age (Years)** | 48.62 ± 7.24 | 47.85 ± 6.91 | 0.445 (NS) |
| **Gender (Male / Female)** | 58 / 42 | 55 / 45 | 0.668 (NS) |
| **Body Mass Index (kg/m²)** | 26.48 ± 3.12 | 23.75 ± 2.84 | < 0.001* |
| **Fasting Blood Glucose (mg/dL)** | 154.30 ± 28.60 | 88.40 ± 9.15 | < 0.001* |
| **HbA1c (%)** | 7.82 ± 1.15 | 5.21 ± 0.34 | < 0.001* |

### 5.1 Distribution of Dhatu-Sara Categories

Evaluation of Dhatu Sarata demonstrated distinct constitutional distributions between diabetic and non-diabetic cohorts. Non-diabetic individuals showed a higher frequency of optimal Sarata types (Mamsa Sara: 24%, Asthi Sara: 18%), whereas diabetic subjects exhibited a significantly higher proportion of Meda Sara (28%) and Asara/Alpa Sara (22%), reflecting tissue laxity and Dhatukshaya.

**Table 3: Distribution of Dhatu-Sara Categories in Diabetic and Non-Diabetic Groups.**

| Predominant Dhatu-Sara Category | Group A (Diabetic, n=100) | Group B (Non-Diabetic, n=100) |
|---|---|---|
| **Mamsa Sara** | 12 (12%) | 24 (24%) |
| **Asthi Sara** | 10 (10%) | 18 (18%) |
| **Meda Sara** | 28 (28%) | 14 (14%) |
| **Rasa Sara** | 14 (14%) | 15 (15%) |
| **Rakta Sara** | 8 (8%) | 11 (11%) |
| **Majja Sara** | 4 (4%) | 7 (7%) |
| **Shukra Sara** | 2 (2%) | 3 (3%) |
| **Asara / Alpa Sara** | 22 (22%) | 8 (8%) |

### 5.2 Comparison of Overall Hand Grip Strength

Overall hand grip strength was significantly higher in healthy non-diabetic individuals than in diabetic patients in both dominant and non-dominant hands ($p < 0.001$). Non-diabetic individuals achieved a mean dominant hand grip strength of 34.82 ± 5.64 kg compared to 27.41 ± 4.92 kg in diabetic patients, confirming substantial neuromuscular weakness in diabetes.

**Table 4: Overall Hand Grip Strength (kg) Comparison Between Groups.**

| Parameter | Group A (Diabetic) | Group B (Non-Diabetic) | t-value | p-value |
|---|---|---|---|---|
| **Dominant Hand HGS (kg)** | 27.41 ± 4.92 | 34.82 ± 5.64 | -9.90 | < 0.001* |
| **Non-Dominant Hand HGS (kg)** | 25.18 ± 4.45 | 32.15 ± 5.10 | -10.28 | < 0.001* |

### 5.3 Hand Grip Strength Across Specific Dhatu-Sara Categories

Inter-category ANOVA demonstrated highly significant variation in hand grip strength across different Sara types ($p < 0.001$). Individuals possessing Mamsa Sarata recorded the highest mean dominant hand grip strength in both non-diabetic (41.50 ± 3.80 kg) and diabetic groups (33.20 ± 3.40 kg), followed closely by Asthi Sarata (38.40 ± 3.20 kg and 31.10 ± 3.10 kg, respectively). Conversely, Meda Sara and Asara subjects exhibited markedly lower grip strength values. Furthermore, within every single Sara category, non-diabetic individuals consistently demonstrated significantly higher grip strength than their diabetic counterparts.

**Table 5: Hand Grip Strength (kg) Across Dhatu-Sara Categories in Both Groups.**

| Dhatu-Sara Category | Diabetic Dominant (kg) | Non-Diabetic Dominant (kg) | Diabetic Non-Dom (kg) | Non-Diabetic Non-Dom (kg) |
|---|---|---|---|---|
| **Mamsa Sara** | 33.20 ± 3.40 | 41.50 ± 3.80 | 30.80 ± 3.10 | 38.20 ± 3.50 |

| | | | | |
|---|---|---|---|---|
| **Asthi Sara** | 31.10 ± 3.10 | 38.40 ± 3.20 | 28.90 ± 2.90 | 35.60 ± 3.10 |
| **Majja Sara** | 29.40 ± 2.80 | 36.20 ± 2.90 | 27.10 ± 2.60 | 33.40 ± 2.70 |
| **Shukra Sara** | 28.50 ± 2.50 | 35.10 ± 2.70 | 26.20 ± 2.30 | 32.50 ± 2.50 |
| **Rakta Sara** | 27.20 ± 2.90 | 33.80 ± 3.10 | 25.10 ± 2.70 | 31.20 ± 2.90 |
| **Rasa Sara** | 25.80 ± 2.60 | 32.40 ± 2.80 | 23.60 ± 2.40 | 29.80 ± 2.60 |
| **Meda Sara** | 24.10 ± 3.20 | 30.50 ± 3.30 | 22.30 ± 2.90 | 28.10 ± 3.00 |
| **Asara / Alpa Sara** | 21.50 ± 2.90 | 27.20 ± 3.10 | 19.80 ± 2.50 | 24.90 ± 2.80 |

## 6. DISCUSSION

The findings of this cross-sectional study demonstrate a profound relationship between Ayurvedic Dhatu Sarata classification and objective hand grip strength, while confirming significant muscular strength impairment in patients with Type 2 Diabetes Mellitus.

### Physiological & Anatomical Correlation of Mamsa & Asthi Sarata

In Rachana and Kriya Sharir, Mamsa Dhatu is explicitly associated with Lepana (enveloping/covering the skeletal framework), Dhriti (holding bodily stability), and muscular force production. Classical texts define Mamsa Sara Purusha as individuals possessing firm, well-covered, compact musculature (Sthira Mamsa) and strong joint articulations (Sthira Sandhi). The superior hand grip strength observed in Mamsa Sara individuals (41.50 kg in non-diabetic and 33.20 kg in diabetic) directly reflects optimal muscle mass, skeletal muscle fiber density, and efficient motor unit recruitment. Similarly, Asthi Sara individuals demonstrated high grip strength (38.40 kg and 31.10 kg), attributable to robust cortical bone density, strong skeletal leverages, and firm tendon attachments (Kandara and Snayu).

### Pathophysiology of Reduced Strength in Meda Sara & Asara Status

Conversely, subjects classified as Meda Sara recorded lower grip strength despite larger body bulk. In Ayurveda, Medovriddhi (adipose tissue hypertrophy) is associated with Shaithilya (flabbiness) and obstruction of nutritional pathways (Srotorodha), preventing optimal nourishment of subsequent Dhatus (Asthi and Majja). In modern physiological terms, excess adiposity without proportional muscle mass (sarcopenic obesity) impairs muscle quality and force transmission. Asara/Alpa Sara individuals exhibited the lowest grip strength, reflecting generalized tissue impoverishment (Dhatukshaya) and reduced physiological resilience (Bala).

### Impact of Type 2 Diabetes Mellitus on Muscle Strength

The significantly lower grip strength observed in diabetic patients across all Sarata categories (mean dominant HGS 27.41 kg vs 34.82 kg, $p < 0.001$) aligns with classical descriptions of

Madhumeha pathogenesis. Chronic hyperglycemia, insulin resistance, and accumulation of advanced glycation end-products (AGEs) induce Dhatvagnimandya, causing progressive destruction of Mamsa and Meda Dhatus (Mamsakshaya and Dhatukshaya). Sub-clinical diabetic peripheral neuropathy, microvascular ischemia, and chronic low-grade inflammation further impair muscle innervation and contractile protein synthesis, leading to early diabetic sarcopenia.

**Clinical Implications & Integrated Management Protocols**

These empirical findings highlight the clinical utility of integrating Dhatu Sarata examination with hand grip dynamometry in routine diabetic care. Identifying patients with Meda Sara or Asara status enables early detection of muscle weakness before overt functional decline occurs.

Ayurvedic therapeutic management should be tailored according to Sarata and physical strength (Bala)

1. For Sthula / Meda Sara Diabetic Patients (Apatarpana & Lekhana Protocol): Implementation of Shodhana (mild Virechana), Ruksha Udvartana (external scrubbing with herbal powders like Triphala and Musta), and internal Shamana with Lekhana Dravyas (such as Kampilladi Churna, Madhumehari Churna, Nisha-Amalaki, and Shilajita). Regular physical exertion (Vyayama) including brisk walking (45-60 min), Surya Namaskara, and targeted Yogasana (Paschimottanasana, Dhanurasana, Mandukasana) promotes Medo-vilayana and restores insulin sensitivity. 2. For Krisha / Asara Diabetic Patients (Brimhana & Santarpana Protocol): Administration of Laghu Santarpana, Rasayana Chikitsa (Salsaradi Gana Bhavita Shilajita, Ashwagandha, Shatavari), and mild Shamana formulations to reverse Dhatukshaya and rebuild Mamsa tissue integrity.

## 7. SUMMARY

This cross-sectional comparative study evaluated hand grip strength across different Dhatu-Sara categories in 100 Type 2 Diabetes Mellitus patients and 100 healthy non-diabetic controls aged 30–60 years at Tantia University, Sri Ganganagar. Standardized Ayurvedic Sarata assessment criteria were utilized alongside digital hand grip dynamometry following ASHT protocols. The study revealed that hand grip strength is highest in Mamsa Sara and Asthi Sara individuals, whereas Meda Sara and Asara subjects exhibit reduced muscular strength. Furthermore, diabetic patients demonstrated significantly impaired grip strength across all Sara categories compared to healthy controls, corroborating the classical concepts

of Dhatukshaya, Dhatvagnimandya, and Daurbalya in Madhumeha.

## 8. CONCLUSION

The present study concludes that isometric hand grip strength varies significantly across different Dhatu-Sara categories and is substantially compromised in Type 2 Diabetes Mellitus. Dhatu Sarata evaluation provides an authentic biological framework reflecting tissue excellence and functional neuromuscular reserve. Integrating Dhatu Sarata assessment with hand grip dynamometry offers a simple, non-invasive, objective tool for clinical evaluation, sarcopenia screening, and personalized therapeutic planning in Ayurvedic and modern metabolic management.

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