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Assessment of Meda Dhatu Dushti WSR. to Serum Insulin Levels

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ABSTRACT: Assessing Meda Dhatu Dushti (fat tissue imbalance) in Ayurveda involves examining subjective symptoms like excessive sweating, sweet taste, laziness, and body odor, alongside objective signs such as obesity, abdominal fat, tumors, and skin issues, correlating classical signs with modern metrics like BMI, lipids (triglycerides), and leptin levels, recognizing it as the root of disorders like obesity, diabetes, and PCOD, linking it to Medovaha Srotas Dushti (channel obstruction) and Agni Mandya (weak digestion).Serum insulin refers to the amount of the hormone insulin in your bloodstream, measured via a blood test, crucial for regulating blood sugar by helping cells absorb glucose for energy; it's used to diagnose diabetes, insulin resistance (often with prediabetes/metabolic syndrome), hypoglycemia, and pancreatic tumors (insulinomas), usually requiring a fast before the blood draw for accurate fasting levels. Levels help assess pancreas function and how effectively your body uses insulin, working alongside glucose tests for a complete picture of metabolic health. Also levels of serum Insulin is closely related to obesity which we can compare it to meda dhatu dushti and meda dhatvagnimandya. The assessment of Meda Dhatu Dushti (vitiation of fat tissue) and serum insulin levels involves an integrated approach bridging Ayurvedic diagnostics with modern metabolic markers, particularly in cases of obesity (Sthaulya), Metabolic Syndrome, and Diabetes (Madhumeha).This Research paper indicates a strong correlation between Medovaha Srotas Dushti (dysfunction of fat channels) and insulin resistance.

KEYWORDS: Meda Dhatu, Serum Insulin, Obesity

INTRODUCTION

In Ayurved, Diagnosis of each disease depends on Dosha- Dushya Sammurchhana. The assessment of invovled dushya is performed with its dushti lakshanas which are very subjective. to make these parameters more objective we can correlate the biochemical indicators with these subjective parameter. In today' s sedentary lifestyle Meda Dhatu Dushti is very widespread. So in this project we will try to develop a diagnostic tool for it' s assessment. sues, primarily involves liver, muscle, and adipose tissue. Insulin resistance impairs glucose Insulin resistance, identified as an impaired biologic response to insulin stimulation of target tisdisposal, resulting in a compensatory increase in beta-cell insulin production and hyperinsulinemia. Serum insulin will be assessed by CLIA (Chemiluminescence Immuno Assay) Method. **The normal range of S.Insulin is- 1.5-25microIU/ml in fasting state**. Insulin resistance can affect anyone — you don't have

to have diabetes — and it can be temporary (for example, using steroid medication for a brief period causes insulin resistance) or chronic. The two main factors that seem to contribute to insulin resistance are excess body fat, especially around your belly, and a lack of physical activity.Having a family history of insulin resistance (family members with prediabetes, type 2 diabetes, and/or PCOS) can also contribute to insulin resistance.

People who have prediabetes and Type 2 diabetes usually have insulin resistance. People with Type 1 diabetes can also experience insulin resistance.If you have insulin resistance, but your pancreas can increase insulin production to keep your blood sugar levels in range, you won't have any symptoms.But over time, the condition can get worse, and the cells in your pancreas that make insulin can wear out. Eventually, pancreas can't produce enough insulin to overcome it, leading to elevated blood sugar.

Rationale -The assessment criteria for meda dhatu dushti is required to diagnose a wide range of metabolic and lifestyle disorder easily,to determine the patients overall strength and vitality and formulate personalized treatment plans.

MATERIALS & METHODS

1) Charaka Samhita :

- Charak sutrasthaan 28/15
- Charak sutrasthaan21/5
- Charak sutrasthaan 17/66
- Charak nidansthaan 4/47

2) Sushrut Samhita:

- Sushrut sutrasthaan 15/19
- Sushrut sutrasthaan 15/93

3) Ashtang Hriday:

- Vagbhat sutrasthaan 11/10
- Vagbhat sutrasthaan 11/18

Serum Insulin -

An insulin in blood test measures the amount of insulin in a sample of your blood. Insulin is a hormone that your pancreas makes. It helps move blood glucose (blood sugar) from your bloodstream into your cells where it's used for energy. Glucose comes from many foods you eat. It's your body's main source of energy.Normally, insulin and blood glucose levels rise and fall together:Blood glucose levels increase after you eat.When blood glucose rises, your pancreas releases more insulin into your blood.The insulin lets glucose get into your cells, which lowers your blood glucose level.When your blood glucose level returns to a range that's normal for you, your insulin levels decrease, too.

The metabolic consequences of insulin resistance can result in obesity, hyperglycemia, hypertension, dyslipidemia, hyperuricemia, elevated inflammatory markers, endothelial dysfunction, and a prothrombotic state. PCOS (menstrual irregularities, hirsutism, acne, and alopecia), Acanthosis nigricans .The predominant consequence of insulin resistance is type 2 diabetes(T2D)-(NCB bookshelf- Insulin Resistance-Andrew M. Freeman; Luis A. Acevedo; Nicholas Pennings.Last Update: August 17, 2023.)

At the cellular level, insulin acts like a key, binding to cell surface receptors and triggering a cascade that unlocks cells (muscle, fat, liver) to absorb glucose for energy or storage, promoting anabolic processes like glycogen and fat synthesis, and inhibiting breakdown (lipolysis, gluconeogenesis) by activating intracellular

pathways (like PI3K/Akt) that move glucose transporters (GLUT4) to the membrane and regulate gene expression for metabolism.

Insulin resistance -

Insulin resistance (IR) is when cells, primarily in muscle, liver, and fat, don't respond well to insulin, preventing glucose from entering, leading to high blood sugar. The mechanism involves lipid metabolites (like diacylglycerol, ceramide) accumulating in tissues, activating inflammatory pathways (cytokines), causing ER stress, and disrupting the normal insulin signaling cascade (IRS-Akt pathway), ultimately blocking glucose uptake and promoting excessive glucose production by the liver, driving type 2 diabetes.

Mechanisms of Insulin Resistance

Lipid Overload: Excess fatty acids build up in muscle and liver, forming toxic lipid intermediates (like diacylglycerol, ceramide) that interfere with insulin signaling.

Inflammation: Fat cells (adipocytes) release inflammatory signals (cytokines) and free fatty acids (FFAs), activating immune cells (macrophages) to release more cytokines, causing systemic inflammation that impairs insulin action.

Endoplasmic Reticulum (ER) Stress: Accumulation of misfolded proteins, often due to lipid overload, activates the unfolded protein response (UPR), which hinders insulin signaling.

Signaling Pathway Disruption: These factors (lipids, inflammation) cause abnormal serine phosphorylation of Insulin Receptor Substrates (IRS1/2), blocking their ability to relay signals, preventing GLUT4 from moving to the membrane, and reducing glucose uptake.

Liver & Fat Tissue Dysfunction: In the liver, lipid accumulation promotes glucose production; in fat, it increases FFA release, creating a vicious cycle.

Insulin resistance often starts silently but progresses to signs like fatigue, constant hunger, sugar cravings, weight gain (especially belly fat), and mental fogginess, plus physical markers like dark, velvety skin patches (acanthosis nigricans) in folds (neck, armpits, groin), skin tags, and sometimes high blood pressure, high cholesterol, and frequent urination, indicating the body struggles to use insulin effectively for blood sugar control, potentially leading to Type 2 Diabetes.

Common Symptoms & Signs

Fatigue & Low Energy: Feeling tired even after rest.

Increased Hunger & Sugar Cravings: Especially for sweets and carbs.

Weight Gain: Especially around the midsection (belly fat).

Brain Fog: Difficulty concentrating.

Darkened Skin (Acanthosis Nigricans): Velvety patches in skin folds like the neck, armpits, or groin.

Skin Tags: Small, soft growths on the skin.

High Blood Pressure & Cholesterol: Indicators of metabolic stress.

Frequent Urination & Increased Thirst: As kidneys try to flush out excess sugar.

Difficulty Losing Weight: Despite diet and exercise.

Other Associated Symptoms

PCOS: Irregular periods in women.

Yeast Infections: More frequent or stubborn infections.

Blurred Vision.

Hormonal disorders that can cause insulin resistance :-

Issues with certain hormones can affect how well your body uses insulin. Hormonal disorders that can cause insulin resistance include:

Cushing's syndrome: This rare condition happens when there's extra cortisol in your body. Excess cortisol can counteract the effects of insulin, causing the condition.

Acromegaly: This is a very rare but serious condition that happens when you have high levels of growth hormone (GH). High levels of GH can lead to insulin resistance.

Hypothyroidism: This means your thyroid is underactive and doesn't produce enough thyroid hormone. It causes your metabolism to slow down, which can lead to insulin resistance.

Common Methods of Serum Insulin Testing- [15]

1. Radioimmunoassay (RIA)

How it works: Uses radioactive isotopes to detect insulin via antibody binding.

Pros: Very sensitive and widely used in research.

Cons: Radioactive materials require special handling and disposal; not as commonly used today in routine clinical settings.

2. Enzyme-Linked Immunosorbent Assay (ELISA)

How it works: Uses antibodies and color change (via enzyme reaction) to detect insulin.

Pros: High sensitivity and specificity; no radioactive materials needed.

Cons: Requires proper calibration and controls.

3. Chemiluminescent Immunoassay (CLIA)

How it works: Similar to ELISA but uses a chemiluminescent substrate to produce light upon antigen-antibody binding.

Pros: Faster, highly sensitive, automated, widely used in hospitals and diagnostic labs.

Cons: Can be more expensive.

4. Electrochemiluminescence Immunoassay (ECLIA)

How it works: A subtype of CLIA that uses electrical current to trigger light emission.

Pros: Highly accurate and widely used in modern automated platforms.

5. Fluorescent Immunoassay

How it works: Uses fluorescent tags instead of colorimetric or radioactive signals.

Pros: Good sensitivity.

Cons: Less commonly used than ELISA or CLIA in insulin testing.

6. Mass Spectrometry (LC-MS/MS)

How it works: Directly measures insulin molecules based on their mass.

Pros: Extremely accurate and specific; can distinguish between human insulin and synthetic analogs.

Cons: Expensive and not routinely used in clinical settings—mostly research or special cases.

Sample Collection & Preparation:

Sample type: Venous blood (serum or plasma).

Fasting: Typically required (8–12 hours fasting) unless testing for stimulated insulin levels.

Processing: Centrifuge blood to separate serum before testing.

Primary research question

What is the role of meda dhatu dushti in levels of serum insulin?

Study Design

Observational cross sectional study.

Inclusion criteria

• Volunteer aged 15-70 years not having any major diseases like DM, HTN, cardiac diseases, HIV, TB,etc

• Males and females both will be enrolled.

Exclusion criteria

• Volunteer aged less than 15 years and more than 70 years.

• Diagnosed population with diseases like DM,HTN,cardiac diseases, HIV,TB,etc.

CRITERIA FOR THE ASSESSMENT OF MEDA DHATU DUSHTI [1,2,3,5]

SR. NO	ASSESEMENT CRITERIA	YES	NO
1	Atideergha		
2	Atihrasva		
3	Aloma		
4	Atiloma		
5	Atikrushna		
6	Atigaur		
7	Atisthool		
8	Atikrush		
9	Jatilibhav kesheshu		
10	Madhuryam Asasya		
11	Karpadayo suptata daha		
12	Mukhtalukantha Shosha and pipasa		
13	Alasya		
14	Mala kayachidreshu upadeha		
15	Paridaha suptatacha angeshu		
16	Shadpadapipalikabhi mutrabhisarnam		
17	Visra sharirgandha		
18	Nidra		
19	Tandra		
20	Alpa Cheshtita Shwas		
21	Daurbalya		
22	Kasa		
23	Sphika Stana udar lambanam		
24	Snigdha angata		
25	Swedabhad		
26	Atikshudha		
27	Granthi		
28	Vruddhi		
29	Arbud		
30	Udarvruddhi		
31	Parshva Vruddhi		
32	Pleeha Vruddhi		

33	Tanu udar		
34	Keshalomanakhashmashru prapatan		
35	Ksheen kattaya		
36	Sandhi shunyata		
37	Rukshatva		

DISCUSSION

The physiology of the human body is related to doshas, dhatus and malas. Dhatus are basic structural elements of the body. Medodhatu is the fourth dhatu among the seven dhatus. It is derived from mamsadhatu from dhatwagni. It is the sneha predominant dhatu made up of prithvibhuta and jalabhuta. It gives unctuousness, lubrication and insulation to the body parts. In contemporary medicine, it can be correlated with loose connective tissue made up of fat cells or adipocytes, as well as circulating lipids in the blood.Meda Dhatu, the fourth among the seven fundamental Dhatus in Ayurveda, plays a crucial role in maintaining lubrication, stability, and overall metabolic balance. Its vitiation, known as Meda Dhatu Dushti, is responsible for various lifestyle disorders such as obesity, diabetes, and polycystic ovarian disease (PCOD). This review systematically analyzes the classical references and assessment criteria provided in Brihatrayi (Charaka Samhita, Sushruta Samhita, and Ashtanga Hridaya) to understand Meda Dhatu Dushti and its clinical manifestations.

Insulin resistance occurs when the body's cells don't respond well to insulin, a hormone that moves sugar (glucose) into cells for energy, leading to high blood sugar, prediabetes, and potentially type 2 diabetes. Common causes include excess body fat, inactivity, genetics, and poor diet, while signs can be subtle (dark skin patches, large waistline) but often show up in blood tests for high fasting glucose or triglycerides. Management focuses on lifestyle changes like diet, exercise, and weight loss, which significantly improve insulin sensitivity.

Assessment criteria for Meda Dhatu Dushti (imbalance of fatty tissue) are crucial in Ayurveda for accurately diagnosing and managing metabolic disorders like obesity, diabetes, and dyslipidemia, by identifying specific signs (e.g., excess body fat, foul smell, skin issues) and symptoms (e.g., laziness, increased thirst, sweet taste) to guide personalized, holistic treatment and understand its link with modern conditions like insulin resistance. Standardizing these criteria helps bridge Ayurvedic principles with modern diagnostics for better integrative healthcare.And on the basis of the above given table we can examine the percentage of meda dhatu dushti in the patient and correlate it accordingly with serum Insulin levels.

CONCLUSION

The assessment is crucial for determining the patients strength (bala)and the severity of disease which influences the choice and therapy . Also it helps identifying the root cause such as accumulation of ama and impaired medadhatvaagni which prevents the proper nourishment of further dhatu . Assessment of medasara along with this criteria will help in better evaluation of medadhatu vitiation.

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