

Conceptual Study of Mutra Pariksha in Madhumeha (Diabetes Mellitus)

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Abstract -

Background: The whole world is fighting against the challenges of non-communicable disease. In Ayurveda, Diabetes is referred as Madhumeha, a term that directly translated as “sweet urine” disease. Indeed, when blood sugar levels rise above a certain threshold, it spills out into the urine and therefore can be investigated through urine examination. The Madhumeha (DM) has a key lakshana i.e Prabhut avil mutrata.

Objectives: To bridge the gap between the academic and practice.

To create awareness that Ayurved has well narrated about mutra pariksha (urine examination).

Methods: Data collection from Classical texts of Ayurved, modern texts & websites.

Results: Mutra pariksha is the first prior primary examination to diagnose Madhumeha (DM).

Conclusion: Mutra pariksha helps to rule out Madhumeha (DM) in proper time without lengthening the period of disease.

Keywords: Madhumeha, mutra pariksha, urine examination, Avil mutrata.

Introduction :-

In Madhumeha all dravadhatus in reference to kapha from shareera gets eliminated through mutra. This is significant change in physical constitution, chemical contents and biochemical properties in such mutra. The abnormal metabolic admixture of dushtadosha, pradushtadhatu with mutra which is nothing but pradushita mutra or saam mutra. Therefore there is extra addition of ama and its constituents to mutra which make mutra turn avil. Diabetes Mellitus is the general term for disease, which means excessive urination, a sweet urine disease. Urine examination is the cheapest source of estimation of urine glucose. Mutra pariksha is one among Athavidha pariksha. It is Astaumahagada vyadi.

Aim & Objective - To study the role of mutra pariksha (urine examination) in Madhumeha (Diabetes Mellitus). To bridge the gap between the academic and practice. To create awareness that Ayurved has well narrated about mutra pariksha (urine examination).

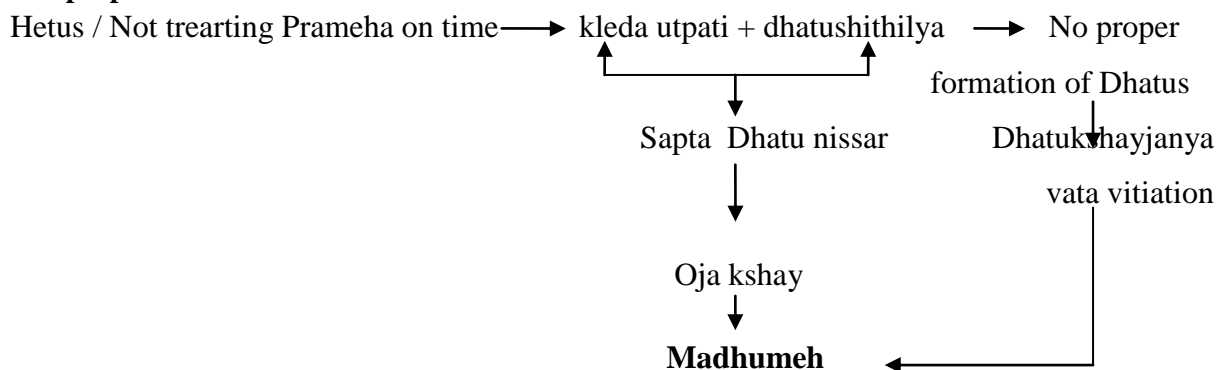
Materials & Methods – The relevant data is collected from the Classical texts, modern books and internet sources .

Nirukti :

There is increased flow or frequency or overall output of urine. Therefore as the word meha is to flow, this name is kept for the disease. Acharya Charak called Kshoudrameha as Madhumeha. It can be a primary or secondary diseased condition of other mehas, whereas acharya Sushruta has stated that all varieties of prameha, if not treated in time, will ultimately leads to Madhumeha which is incurable. In Madhumeha urine is likely honey (sweet in taste)

Causes- Indulgence in sitting on soft cushions for long time, sleeping for long hours, excessive intake of jiggery products etc.

Samprapti -



Mutra Pariksha:- Yogratnakar have the references for mutra pariksha.

Method of collection of Mutra:

During Last prahar of night i.e about 5-6 am the patient should be waked for passing the urine, Patients midstream sample is collected in clean glass vessel. The sample is kept covered with clean cloth till sunrise, because it is examined only in sunlight. Urine sample is taken for the analysis within one muhutra after collection. One muhurta is equal to 1 & 1/2 hour. If sample exposed to sunlight and air for more time urobilinogen changes to urobiline may give thicker colour to urine.

Physical examination:

1. Praman- Mutrapraman = 4 Anjali. The quantity & frequency of urine increased in Mahumeha “Prabhut avil mutrata”
2. Colour-Tejo mahabhoota is the responsible factor for production of all colour. This tejo dhatu in living body is present in the form of pitta. So any “tejo dhatu sarv varnaanam prabha” Tridosha are having important role in offering colour to urine. In certain unusual condition some sharir dhatus are also passing out from the body through urine, that will also affect the colour of urine and gives the colour of that dhatu to urine which passing through it. Varna of mutra in vataj pittaj and kaphaj madhumeha. In madhumeha urine is like honey - Glycosuria, Shuklameha – Whitish chyluria, Lasika/hastimeha- whitish Diabetes insipidus, Haridrameha – Biluria, kalameha- black melanuria, Neelmeha- bluish Indicauria, Atitamra- dark brown concentrated urine, Shukrameha – mixed with semen spermaturia.
3. Rasa (taste) – Taste cannot be directly examined. By observing flies on patients body physician should assume the madhura rasa of the body or interrogation. In Ayurvedic science and in other sciences also have not furnished complete process on this work, with some evidences they are going to determine other rasa, In Madhumeha specimen of urine or urine passed area is get attracted by ants, flies suggest that urine is having madhur rasa. In modern science also only madhurta and amlata (acidity) of urine determine madhurta by using benedicts reagent and amlata with the help of litmus paper.
4. Sparsha (Touch)- This can be carried out under tactile perception .This depends upon the judgments and determination power of the examiner. The temperature of urine can be find out by specimen temperature may become isothermal to the room temperature. The normal mutra possess snigdghata, pichchilata, unless there is marked increase in these qualities in a given sample is very difficult to assist.

5. Gandh (Odour) –Normal smell of urine is “Naati Gandh” means having so irritant smell i.e, aromatic odour or ammonical smell.
6. Transparency – 1)Accha denotes clear urine; Anaccha sample having traces of haziness; Avil sample denotes markedly turbid.
7. Density – Can be determined firstly by darshana pariksha of sample and secondly by putting water drop in urine and then behavior of water is observed.
 - If it mixed with urine immediately and then sinks below the surface of container considered a low density i.e Tanu.
 - If it sinks to bottom without disintegrated in the middle is considered as high density i.e Sandra.
 - It is seen going down to a small distance then spreads, disintegrates and mixed with urine in the middle only without reaching the bottom of the container as normal density i.e Taral.

Tailbindu pariksha (oil drop test) – This is a special technique and important way of mutra pariksha in Ayurveda. This test is mainly carried out for prognostic purpose. The prognosis carried by observing behavior of oil drop when given to surface of urine. Til tail is used in this process. It help in detection of sadhya-asadhya vyadhi. In madhumeha owl bird shape spread of oil in incurable disease.

Samanya lakshana –Prabhut avil mutrata , Increased quantity and turbidity of urine are the characteristic features. Due to the combination of doshas and dushyas: different colours are seen in the urine and pramehas (diabetes) are classified depending upon the colour of the urine.

Features Of Mutra In Madhumeha- Varieties Are Predominantly Kaphaja

1. Clear, copious, white, cold, odourless with little turbidity and greasiness, almost resembles like water are the features of urine in Udakmeha.
2. Urine very sweet like the juice of sugarcane is found in Ikshumeha.
3. Urine kept undisturbed for sometime in a pot assuming thickness is seen in Sandrameha.
4. In Surameha the urine resembles sura (alcoholic beverage prepared with flour) with clear fluid on top and sediments at the bottom .
5. In Pistameha, the urine appears thick as though mixed with flour and is white in colour, the patient experiences horripulations often.
6. In Sukrameha , urine resembles semen or even mixed in it.
7. In Siktameha, urine contains small particles resembling like sand
8. In Sitameha, urine is copious, sweet in taste and very cold to touch
9. In Sanairmeha, the elimination of urine is very frequent and very slow.
10. In Lalmeha, the urine resembles saliva with appearance of threads and is sticky.

Pitta predominance -

1. In Ksharmeha, urine resembles solution of alkali in smell, colour, taste and touch.
2. In Nilmeha it is blue, in Kalameha it is like charcoal.
3. In Haridrameha, the urine is pungent and deep yellow and the patient experiences burning sensation during urination.
4. In Manjisthameha, urine is foul smelling and resembles decoction of manjistha(Rubia cardifolia).
5. In Raktahmeha the urine is having foul smell, hot, salty taste and red in colour like that of blood.

Vata predominance -

1. In Vasameha, the urine is mixed with muscle fat or appears like and is voided frequently.
2. In Majjameha, The urine mixed with marrow or appears like that and is voided frequently.
3. In Kshaudrameha, the urine looks like a decoction, is sweet and non sticky.

4. In Hastimeha, the person passes urine continuously like an elephant, slowly (without pressure) and it is mixed with lasika (tissue fluid).

Modern concept of diabetes mellitus -

Diabetes Mellitus is metabolic disorder characterized by high blood sugar (Glucose) level associated with other manifestations. In most of the causes, DM develops due to deficiency of Insulin.

Signs & Symptoms of DM:-

Various manifestations of Diabetes Mellitus develop because of three major setbacks of Insulin deficiency.

1. Increased blood sugar level (300-400mg/dl) due to reduced utilization by tissue.
2. Mobilization of fats from adipose tissue for energy purpose, leading to elevated fatty acid content in blood. This causes deposition of fat on the wall of arteries and development of atherosclerosis
3. Depletion of proteins from the tissues.

Features of Diabetes Mellitus in relation with urine:

1. Glucosuria - Loss of glucose in urine is known as glucosuria. Normally glucose doesn't appear in urine. When glucose level rises above 180mg/dl in blood, glucose present in urine. It is the renal threshold level for glucose.
2. Osmotic - Diuresis due to osmotic effects is called osmotic diuresis. The excess glucose in the renal tubules develops osmotic effect decreases the reabsorption of water from renal tubules resulting in diuresis. It leads to polyuria and polydypsia.
3. Polyuria - Excess urine formation with increase in frequency of voiding urine is called polyuria. It is due to the osmotic diuresis caused by increases in blood sugar level.
4. Acidosis- During Insulin deficiency glucose cannot be utilized by the peripheral tissues for energy. So, a large amount of fat is broken down to release energy. It causes the formation of excess ketoacids leading to acidosis. One more reason for acidosis is that, the ketoacids are excreted in combination with sodium ions through urine (ketonuria). Sodium is exchanged for hydrogen ions which diffuse from the renal tubules into ECF adding to acidosis.
5. Circulatory shock- The osmotic diuresis leads to dehydration, which causes circulatory shock. It occurs only in severe diabetes.

Complications of diabetes mellitus with effect to urine-

Degenerative changes in kidney known as diabetic nephropathy. Depending upon the degree of reabsorption, glucose possesses high threshold substance.

High threshold substances- The food substances like glucose, amino acids, aceto-acetate ions and vitamins are completely reabsorbed from renal tubules and do not appear in urine under normal conditions. These substances can appear in urine only if their concentration in plasma is abnormally high or in renal diseases when reabsorption is affected. So, these substances are called high threshold substances.

Tm Value – The substances reabsorbed actively from renal tubules require some specific transport system. The rate of reabsorption of any substance relays on the rate at which this specific transport system operates. The transport system, in turn depends upon the carrier substances or enzymes. So, for every actively reabsorbed substance, there is a maximum rate at which it could be reabsorbed. The maximum rate at which a substance is reabsorbed from the renal tubule is called tubular transport maximum or Tm. For glucose TmG is 380mg/minute. Every substance having Tm value has also a threshold level in plasma or blood. Below that threshold level, the substance is completely reabsorbed and does not appear in urine. When the concentration of that substance increases above that level, the

excess amount is not reabsorbed and, so it appears in urine. This level is called the renal threshold of the substance. eg: The renal threshold for glucose is 180mg%. That is, glucose is completely reabsorbed from tubular fluid if its concentration in blood is below 180mg% then glucose does not appear in urine. But as the blood glucose level rises beyond 180mg%. It is not reabsorbed completely, hence glucose appears in urine.

Urine Examination :- Urine analysis is one of the commonly performed laboratory tests in clinical practice.

Indication of urine examination- 1) Suspected renal diseases like glomerulo nephritis.

2) Detection and management of metabolic disorders like DM

Collection of urine Sample: -

1. First morning midstream- for routine examination and fasting
2. Random- Collected at any time for routine examination.
3. Post- prandial – Collected 2 hrs after a meal in the afternoon. Sometimes requested for estimation of glucose(to monitor insulin therapy in DM) or of urobilinogen
4. 24 hour - Quantitative estimation of protein

Physical Examination:-

1. Volume – Normal output 600 – 2000ml/ 24hr. Polyuria >2000ml/24 this is seen in DM (osmotic diuresis)
2. Colour – Normal pale yellow, Colorless dilute urine in Diabetes Mellitus.
3. Appearance- Normally clear. Foamy urine occurs due to protein presence, uniformly cloudy, do not settle at bottom due to bacteria.
4. Odour – Freshly voided aromatic. Abnormal odour, fruity due to ketoacidosis, foul smell in UTI, etc.
5. Specific gravity –It is a measure of concentrating ability of kidneys and is determined to get information about tubular function. Normal specific gravity 1.003- 1.030. Its increases in DM. It can be measured by urinometer or reagent strip method.
6. pH – Normal pH- 4.6 to 8.0. Acid urine is found in diabetes mellitus. In unexplained metabolic acidosis, measurement of urine pH is helpful in diagnosing renal tubular acidosis. It can be measured by pH paper, pH meter or reagent strip test.

Chemical Test :-

1. Glucose –The main indication for testing glucose in urine is detection of unsuspected diabetes mellitus or follow-up of known diabetic patients. Practically all of the glucose filtered by glomeruli is reabsorbed by proximal renal tubules and returned to circulation . Normally very small amount of glucose is excreted in urine (< 500 mg/24 hours or < 15 mg/dl) that cannot be detected by the routine tests. Presence of detectable amount of glucose in urine is called as glucosuria or glycosuria. Glycosuria results if the filtered glucose load exceeds the capacity of renal tubular reabsorption. Most common cause is hyperglycemia from DM.

Test for detection of glucose in urine :-

1. Copper reduction methods – Benedicts qualitative method .

Principle – Cupric ions(blue) + Sugar $\xrightarrow[\text{Heat}]{\text{Alkali}}$ Cuprous oxide(red) + Cuprous hydroxide (yellow). Sensitivity of 200mg glucose/ dl

Benedicts test grading Colours: Blue = Nil, Green = Trace(with precipitate +1) , Brown 2+, Yellow-Orange 3+, Brick – red 4+.

2. Urine reagent strip test for glucose :

Principle –Each mole of glucose produces one mole of peroxide and each mole of peroxide reduces one mole of oxygen.Sensitivity is 100mg glucose/100 ml.

Stage I: Glucose + Oxygen(room air) $\xrightarrow{\text{GLUCOSE OXIDASE}}$ Gluconic acid + Hydrogen peroxide

Stage II:Hydrogen peroxide + Chromogen $\xrightarrow{\text{PEROXIDASE}}$ Oxidized chromogen (Blue) + H₂O.

2. Proteins – Normally ,Kidneys excrete scant amount of protein in urine.Proteinuria refers to protein excretion in urine greater than 150mg/24 hours in adult.Quantitative estimation of protein are detection of microalbuminuria or early diabetic nephropathy.Microalbuminuria is defined as urinary excretion of 30 to 300 mg/24hours (or 2- 20 mg/dl) of albumin in urine.It is considered as earliest sign of renal damage in Diabetes mellitus.It indicates increase in capillary permeability to albumin and denotes microvascular disease.Microalbuminuria is an independent risk factor for cardiovascular disease disease in diabetes mellitus.

Test for detection of proteinuria –

Heat & acetic acid test(boiling test) – This test is based on the principle that proteins get precipitated when boiled in an acidic solution.

Reagent strip test – Principle: The principle is called as “protein error of indicators” meaning that one color appears if protein is present and another color if protein is absent.Sensitivity is 5-10mg/dl.

Detection of microalbuminuria –

It cannot be detected by routine tests for proteinuria. Methods include :Measurement of albumin in 24 hr sample.Measurement of albumin – creatinine ratio in a random urine sample.Measurement of albumin in an early morning or random urine sample.Tests strip that can screen microalbuminuria are available commercially.

3. Ketones – Excretion of ketone bodies (acetoacetic acid, β-hydroxybutyric acid& acetone) in urine is called as ketonuria. Ketones are breakdown of fatty acids and their presence in urine is indicative of excessive fatty acid metabolism to provide energy.

Principle: Rothera’s test (Classic nitropruside reaction) & Reagent strip test for ketone bodies in urine.

Ketones are detected as acetoacetic acid and acetone but not β- hydroxybutyric acid.

Rothera’s test - Acetoacetate + Sodium nitroprusside $\xrightarrow{\text{ALKALINE pH}}$ Purple Color

Reagent strip test – Acetoacetate + Sodium nitroprusside+ Glycine $\xrightarrow{\text{ALKALINE pH}}$ Purple color.

Result –

Mutra pariksha is the first prior primary examination to diagnose Madhumeha (DM). By Mutra Pariksha (urine examination) one can assess any running pathology inside the body. There is a significant role of mutra pariksha (Urine examination) in madhumeha (Dm). Urine examination is helpful in Detection and management of metabolic disorders like DM. Ancient Science also had evidences of mutra pariksha. Tailbindu pariksha has owl bird shape spread of oil in Madhumeha incurable disease. Abundant urine of high specific gravity is characteristic of diabetes mellitus. In classics it has been mentioned that urine of person is constantly of oil, honey or alcohol is likely to die soon. There is a significant role of mutra pariksha (Urine examination) in madhumeha (DM).In modern science also explained the same views about urine examination in DM.

Discussion-

It is an inexpensive test. Mutra pariksha helps to rule out Madhumeha (DM) in proper time without lengthening the period of disease. For vyadhi vinischay Vaidyas have to use yukti pramana for mutra pariksha.Hence pariksha depends upon the senses & the mind as the instrument for it. The act of this examination or pareeksha is conducted sometimes through pratyaksa or anumana pramana sometimes through aptopadesha. Though we are blessed today with the help of modern equipment we

should achieve better approach of pariksha paddhati to serve the society in health interest, where the time will be spent in proper diagnosis, proper treatment in proper time without lengthening the period of disease to grow in individual. A common people can also understand about abnormalities in Mutra and aware become aware of Diabetes.

Conclusion:

Easy to perform. Double voided specimen for best results Urine testing for glucose. Ketonuria + glucose in urine may indicate DM Microalbuminuria is an earliest sign of renal damage in diabetes mellitus. The pareeksha is also depend upon the accuracy of the examiner organs and his discrimination power over different odours. There are some similarities found in mutra pariksha of Ayurveda with modern urine examination.

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ISSN 2349-638X

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