



Indian Journal of Agriculture and Allied Sciences

A Refereed Research Journal

ISSN 2395-1109

e-ISSN 2455-9709

Volume: 2, No.: 2, Year: 2016

www.mrfsw.org

Received: 30.05.2016, Accepted: 09.06.2016

CORRELATION OF PRAMEHA (MADHUMEHA) WITH DIABETES MELLITUS

***Ravi Dabas and **Priyadarshini Tewari**

**JR2 and **Assistant Professor (St-II), Department of Vikriti Vigyan, Faculty of Ayurveda, Institute of Medical Sciences, Banaras Hindu University, Varanasi, Corresponding Author: Ravi Dabas*

Abstract: Prameha (Diabetes mellitus) is a Kapha pradhana vyadhi in which meda is a pradhana (main) Dushya. Vitiated Vata, Pitta and Kapha mixes with 10 Dusyas in the Mutravaha srotas leading to manifestation of twenty types of Prameha, The disease Madhumeha is included under Vataja prameha and it is stated that if Prameha patients not treated may get converted into Madhumeha. It is characterized by two symptoms Prabhuta mutrata (excessive urination) and avila mutrata (urine turbidity). Madhumeha patients pass urine having sweet in taste and smell of the body resembling like honey. Diabetes mellitus is not a disease but metabolic syndrome of carbohydrate metabolism, characterised by hyperglycemia and glycosuria due to inadequate production and use of insulin. Due to similarities between their causative factors, pathogenesis, signs and symptoms, classification and complications, Prameha (Madhumeha) can be equated with Diabetes mellitus, so this article is effort to provide similarities and correlation between Madhumeha and Diabetes mellitus.

Key Words: Meda, Madhumeha, Prameha, Diabetes mellitus, madhu.

Introduction: Amongst twenty types of prameha, madhumeha is described in Ayurvedic texts as characterised by patient passes the urine having similarities with Madhu (Honey) having Kashaya and Madhura taste, pandu colour and Ruksha guna^[1]. Diabetes Mellitus is a metabolic disorder characterised by hyperglycemia due to defect in carbohydrate, fat and protein metabolism resulting from abnormalities in insulin secretion or insulin action or both.

Usually, Madhumeha is being correlated with Diabetes mellitus by the physicians. Madhumeha is a vyadhi with definite pathological changes in mutra(urine) seen with some other changes like presence of madhuryata (sweetness) means presence of sugar in the urine and presence of sugar in the blood can be understand as tanu madhuryata^[2]. Correlation of madhumeha with Diabetes mellitus is acceptable. Both have similarity of pathogenesis, Clinical manifestations, and symptoms, classification, complications and also in management, the correlations are discussed under the points below given.

Nidana (Causative Factors): Various similarities found between nidana explained for madhumeha in Ayurvedic texts and causative factors for D.M. mentioned in modern science.

1. In Ayurveda madhumeha occurred due to excess consumption of madhura, guru and snigdha ahara and in modern science, over eating^[3] is considered to be the factor for D.M. Prameha is also mentioned under Santharpanajanya vyadhi^[4]. Santharpana janya ahara means food that nourish our body if we take it in excess then it probably causes madhumeha, Santharpana ahara can be correlated with carbohydrate.
2. Charaka mentioned Vihara karan Aasayasukham (Pleasurable sleep), swapnasukham (diwaswapna) as a predisposing for prameha^[5] and in modern science same factors like sedentary lifestyle causes occurrence of D.M.^[6]
3. Bhavaprakasa described Stholya as nidana for prameha^[7]. As shtholya is similar to Obesity, in modern science obesity is mentioned as powerful amplifier of the insulin resistance that leads to D.M and risk

of developing Type 2 DM increases 10 fold in people with a BMI > 30 kg/m²^[3]

- In Ayurveda Beejadosh (genetic) And Kulajadosha (hereditary)^[8] are explained responsible for prameha under Sahaj karan, genetic and hereditary factors are mentioned for D.M.^[9]
- Charaka also described mythological story in which factors like Haviprasha (intake of ghee)^[10] responsible for Prameha, which can be correlated with modern science fatty diets which may increase FFAs and exacerbate insulin resistance that leads to DM.^[3]

Today's science says that there is specific gene for specific enzyme within a cell. With the lost or alteration of gene, the corresponding enzyme is also lost or altered. D.M. has the *susceptibility* gene located in HLA region of chromosome 6^[11] that also have genes for antigens (the molecules that normally tell the immune system not to attack itself). The enzyme glucokinase on chromosome 7 and gene coding for hepatic nuclear factor 1 Alfa and 4 Alfa are

responsible^[12]. Our acharya Charaka says if the particular bhaga or bhaga avayava of bheej is affected then the garbha will be having abnormality in structural or functional of that particular organ^[13]. On the basis of what above explained we can say that Ayurvedic Acharyas had the knowledge of genetics in those days.

In Ayurveda Sushruta describes prameha as Adi-bala Pravritta vyadhi term "Adi" means the transmission of the disease from either mother or father to the garbha through sonita and/or sukra at the time of their sammurchana in garbhashaya^[14]. In modern science, hereditary factor is known as an important factor to D.M. It seems like that diabetes is present from birth in the form of inherently defective carbohydrate mechanism this defect may be latent form for many years but it came to light by stress of pregnancy, corticotrophin therapy, Cushing's syndrome, or even by over eating Thus^[15]. We can say that nidana of a Madhumeha described in Ayurveda are almost similar to that of causative factors of D.M. in modern science.

Nidana	Madhumeha	Diabetes mellitus
Ahara	Kapha vardhaka ahara-vihara like madhura, snigdha, guru bhojana	Excessive intake of sweet, oily food and Over eating
Vihara	Sayya-asana-swapna sukha	Sedentary life style, Physical inactivity
Sahaj	Beejadosh and Kulajadosha	Genetic and Hereditary factors
Mythological	Haviprasha (intake of ghee)	Fatty diet
	Stholya	Obesity

Samprapti (Pathogenesis): Correlation of Madhumeha with that of D.M. can be better explained in the following way:

- According to Ayurveda Acharya pathogenesis of Madhumeha mainly involves medovaha srotas^[16]. So on the basis of physioanatomical similarity in the description we can take vapavahana as pancreas. This explanation gives a clue that our Acharyas might know the involvement of pancreas in the samprapti (pathogenesis) of Madhumeha.
- It is very much difficult to explain the insulin resistance in Ayurveda. The pathogenesis of D.M. in obese individual mainly relating to the Insulin resistance and insulin deficiency. Not all obese individuals would suffer from diabetes until pancreas remains healthy and secretes insulin to tackle insulin resistance^[17]. Now we can say that not all the sthola persons will suffer from madhumeha unless they have healthy vapavahana and don't afflicted by beeja or kuladosha.
- In ayurveda agni has been mentioned as played important part in the occurrence of disease like Madhumeha. Insulin may

correlated to medhodhatvagni but for exact correlation evidence in this regard is needed. Aparipakwavastha of dosha and dushya occurred due to dhatvagni mandya^[18]. It indicates metabolic defect in madhumeha.

- Invariable vitiation of kapha dosh causes Madhumeha. Kaphadosha has predominant of prathvi and apamahabhoota. Snigdha dravyas and Madhur rasa generally help in building kapha dosha in the body and kapha is having with similar qualities. Sthiratwa, dardya, utshaha, vrishata, gyana and buddhi promoted by normal state of kapha^[19]. Kapha is also known as Bala and Ojas by charaka^[20]. Bahudravatha of kapha causes Madhumeha, it will not be able to nourish the body because this abnormal bahudrava shleshma travels all over the body with rasa dhatu, it causes tanumadhuryatha^[21]. Which can be correlated as hyperglycaemic state in D.M. this can be understood by testing of blood sample for glucose.

On the basis of references pathogenesis of Madhumeha can be correlated to pathogenesis of D.M. It can be explained as-

Samprapti	Madhumeha	Diabetes mellitus
	Dhatwagni mandya	Metabolic impairment
	Medodhatwagni	Insulin
	Medodhatwagni-mandya	Insulin deficiency

Rupa (Clinical Features): Many of lakshana explained in ayurveda texts for madhumeha is described in modern counterpart too so i am trying to correlate same here.

1. Prabhoot-avila mutrata is considered as pratyatma lakshana of prameha. Bahudrava kapha along with kleda pradhana dushya in the basti is the cause for prabhoot-avila mutrata^[22]. Modern science described same reason for polyuria that the osmotic diuretic effect of glucose in the kidney tubules.^[23]
2. Madhura mutra described in ayurveda can be taken as glycosuria. As ojas or bahudrava, kapha^[24] is exerted through mutra and produce above said symptom. Glycosuria occurs when the blood glucose concentration exceeds the renal threshold (The capacity of renal tubules to reabsorb glucose from the glomerular filtrate) at approximately 10 mmol/dl (180mg/dl). The severity of the classical 'osmotic' symptoms of polyuria and polydipsia is related to the degree of glycosuria^[3]
3. High sugar level in blood or hyperglycaemic state can be correlated with Tanumadhuryata in ayurveda.

4. Bahu akankshi^[25] described as a lakshana in the Apathya Nimittaja Madhumeha the same is mentioned in modern science in term of polyphagia.
5. Shayya-Asana- Swapnasheela^[25] in Apathya-nimittaja can be correlated with sedentary lifestyle.
5. Polydipsia^[25] is described as one the symptom related to hyperglycemia. Pipasa can be said as a lakshana (symptom) which is similar to polydipsia, Bhrish Pipasa^[26] is a symptom mentioned by Acharya Shushruta under Sahaj Madhumeha.
6. Under the Sahaja Madhumeha Krisha^[25] body mentioned as a lakshana and the same is mentioned in modern science in term of lean body due to lipolysis^[25] in Type 1 Diabetes Mellitus.
7. Shushruta has described various conditions for delayed healing^[27] in modern science too delayed healing of wounds has been mentioned as a symptom and the reason for that is the deficient formation of granulation tissues.

Rupa	
Madhumeha	Diabetes mellitus
Prabhuta-avila mutrata	Polyuria and turbidity of urine
Tanu madhuryata	Hyperglycemia
Mutra madhuryata	Glycosuria
Pipasa	Polydipsia
Vrana Krichena Sidyanti	Delayed healing of wounds
Bahu akankshi & Shayya-Asana- Swapnasheela in Apathya-nimittaja Sahaj Madhumeha	Polyphagia and laziness in Maturity onset diabetes (Type 2)
	Juvenile Diabetes (Type 1).

Bheda (Classification): Description of Madhumeha in ayurvedic texts is similar to D.M. in modern science. An attempt to correlate the both is made here.

1. Charaka mentioned Beeja dosh and Kulaja under causative factor of Sahaja Prameha. These patients are said to Krisha (emaciated), ruksha (dry body texture), Bhrish pipasa (excessive thirst), Alpashi^[9,25] (takes less food or loss of appetite these are required to be treated with nourished diet. Genetic factors and hereditary factors explain in modern science^[28] due to which patients are weak, lean and emaciated. These patients developed childhood (juvenile) diabetes and requires a nourish diet. Therefore, Sahaja

- prameha and juvenile (childhood) (Type 1) can be correlated.
2. Apathyanimittaja (Dietary factors) Prameha is caused by excess intake of sweet, unctuous and heavy preparations. These patients are sthoola (obese), balavana (strong), snigdha (unctuous body texture) and afflicted with bahu akankshi (Voracious eater)^[25]. In maturity onset diabetes (Type 2) patients are lazy. So, Apathyanimittaja prameha may be correlated with Maturity onset diabetes (Type 2)
3. Sthoola Krisha^[29] division is similar to Obese and Non-Obese division. So, both Ayurvedic and Modern science with reasoning can be correlated as said above and summarized as:

Bheda	Madhumeha	Diabetes mellitus
Hereditary	Sahaja Madhumeha	Juvenile Diabetes (Type 1)
Dietary	Apathya-nimittaja Madhumeha	Maturity onset diabetes (Type 2)
Physical	Sthoola and Krishna patients	Obese and Non-Obese patients

Updrava [Complications]: In Ancient time our Ayurvedic acharyas like Charaka and Shushruta looked at the patient then observed and then used to write observation. Likewise they observed many updrava (complications) in madhumehi and many of them can be correlated with that of complication of D.M. mentioned in modern science.

1. Sushruta describes Vataja updrava like Udavarta, aruchi, avipaka, atisara, baddha purish^[30] mentioned in ayurveda can be correlated with Gastrointestinal neuropathy shows fullness, nausea, vomiting, dysphagia, diarrhea or constipation may be seen^[31].
2. Diabetic ketoacidosis patient shows thirst, weakness, blurring vision, abdominal pain,

Updrava	Madhumeha	Diabetes mellitus
Nervous system	Kampa	Trembling in hypoglycaemia
	Shoola	Abdominal pain.
Gastrointestinal diseases	Udavarta, aruchi, avipaka, atisara, baddha purish	A vomiting, dysphagia, diarrhea or abdominal fullness, nausea, constipation etc. in gastrointestinal autonomic neuropathy.
	Trishna, bhrama, shoola, shwasa	Thirst, weakness, abdominal pain, air hunger etc. in hypoglycemia.
Eye disease	Tama	Blurring vision
Cardiovascular	Hrdgraha	Pain in chest

Chikitsa (Treatment)

1. In Ayurvedic texts Chikitsa in margavaravnajanya or Apathyanimittaja madhumeha^[35] is very much similar to physical exercise, restricted diet with insulin means (insulin + Diet) given in Type 1 (IDDM).

air hunger^[32] and these symptoms can be correlated with the clinical features of hypoglycaemia and can also be correlated with ayurvedic mentioned updrava like Trishna, bhrama, tama, shoola, and shwasa^[33].

3. Kampa is updrava^[30] which is best correlated with 'trembling'^[32] occurs in hypoglycaemia.
4. Shoola^[30] can be correlated to diabetic neuropathy symptoms like pain in the lower limbs (dull, aching, and/or lancinating, worse at night, and mainly felt on the anterior aspect of the legs)^[34], which occurs due to distribution of one or more spinal nerves usually in the chest wall or abdomen.

2. In Dhatukshayajanya Madhumeha Santarpana Chikitsa^[35] is oral hypoglycaemic drugs with (weight maintenance diet + low energy diet) therapy as in Type 2 (NIDDM). So above treatment can be summarized as:

Madhumeha	Chikitsa	Diabetes mellitus
Aptarpana Chikitsa in Margavarana -janya Madhumeha	Restricted diet, exercise and oral hypoglycemic (sometimes insulin also) in Type 1 (IDDM).	
Santarpana Chikitsa in Dhatukshaya	insulin therapy in Type 2 (NIDDM)	

Discussion

Nidana

1. Madhura, snigdha, guru bhojana and sayya-asana-swapna sukha, avyayam are Kapha vardhaka ahara-vihara these can be correlated with over eating and sedentary life style.
2. Beejadoshha and Kulajadosha mentioned in Ayurveda is similar to Genetic and hereditary factors responsible for D.M.
3. Obesity is explained as a major causative factor for D.M which can be correlated with Sthoulya, obesity causes insulin resistance.

Samprapti (Pathogenesis)

1. In Ayurveda for disease process of Madhumeha agnimandya and dhatwagni has given more importance. It defines metabolic impairment in madhumeha.
2. Madhumeha is caused due to invariable vitiation of kaphadosha. Similarity to D.M., increased level of glucose is present. In recent researches, glucose and kapha are correlated to each other.
3. Ayurveda explained Vapavahana can be best compared to pancreas of modern science, on the basis of physioanatomical similarities.

Rupa (Symptoms)

1. Prabhut-avila mutrata can be best correlated with Polyuria and turbidity of urine.
2. Madhura mutra is noted in the disease which can be taken as presence of sugar in the urine and blood respectively. Pipasa or Polydipsia is same thing mentioned in both sciences.

Bheda (Classification)

1. Sahaja Madhumeha can be correlated with Juvenile (Childhood) diabetes (Type 1)
2. Apathyanimittaja Madhumeha best correlated with Maturity onset diabetes (Type 2).
3. The Sthoola classification is similar to obese and Krishna best correlated with Non-Obese.

Updrava (Complications)

1. Sushruta explained Udavarta, aruchi, avipaka, atisara, baddha purish can be correlated with "Gastrointestinal autonic neuropathy".
2. Ayurveda explained Tama, shoola, shwasa, bhrama can be correlated with modern science ketoacidosis.
3. Skin disease like prameha pidika can be correlated with carbuncles.

Chikitsa (Treatment)

1. Margavarajananya or Apathyanimittaja Madhumeha is best treated by Aptarpana Chikitsa, Which is same to restricted diet, exercise, oral hypoglycemic drugs and insulin also given in Type 1 (IDDM).
2. Dhatukshayajana Madhumeha is best treated by Santarpana Chikitsa which is similar to that of insulin therapy in Type 2 (NIDDM).

Conclusion: Due to similarities between their Nidana (causative factors), Samprapti (pathogenesis), Rupa (signs) and symptoms, classification and Updrava (complications), We can say that Madhumeha can be equated or is similar to Diabetes mellitus.

References

1. Shukla Acharya Vidhyadhar and Tripathi Ravi Dutt. (2007). *Charak Samhita*, Vaidyamanorama vol 1, Chaukhambha Sanskrit Pratishthan, Delhi, C.S.Ni.4/44.
2. Math Ashtavaidyan Vaidyamadhom Cheriya Narayanan Namboodiri. (2007). *Astanga Hrdaya Samhita*, Sasilekha, Commentary of Indu, Chowkhamba Krishnadas Academy, Varanasi. 1st edition, A.H.Ni,10/7, 10/21.
3. Boon Nicholas A., Davidson Sir Stanley. (2007). Davidson's Principles and practice of medicine. 20th edition, ch.21,pg.no-814.
4. Shukla Acharya Vidhyadhar and Tripathi Ravi Dutt. (2007). *Charak Samhita*, Vaidyamanorama

- vol 1, Chaukhambha Sanskrit Pratishthan, Delhi, C.S.Ni.23/3-5.
5. Shukla Acharya Vidhyadhar and Tripathi Ravi Dutt. (2007). *Charak Samhita*, Vaidyamanorama vol 1, Chaukhambha Sanskrit Pratishthan, Delhi, C.S.Ci.6/4.
6. Boon Nicholas A., Davidson Sir Stanley. (2007). Davidson's Principles and practice of medicine. 20th edition, ch.21, p. 808.
7. Bhavmisra. (2005). Bhavaprakasa, Vidyotni hindi commentary (Ed) Bhisagratna Pandit Sri Brahma Sankara Misra (part 2), Chaukhambha Sanskrit Sansthan, Varanasi, 9th edition, Bh.third part, 39/10.
8. Shukla Acharya Vidhyadhar and Tripathi Ravi Dutt. (2007). *Charaka Samhita*, Vaidyamanorama vol 1, Chaukhambha Sanskrit Pratishthan, Delhi, C.S.Ci.6/57.
9. Boon Nicholas A., Davidson Sir Stanley. (2007). Davidson's Principles and practice of medicine. 20th edition, ch.21,p. 811.
10. Shukla Acharya Vidhyadhar and Tripathi Ravi Dutt. (2007). *Charak Samhita*, Vaidyamanorama vol 1, Chaukhambha Sanskrit Pratishthan, Delhi, C.S.Ni.8/11.
11. Mohan Harsh. (2005). *Text book of Pathology*, Jaypee Brothers Medical Publishers(P) LTD, New Delhi., 5th edition. p.844.
12. Yamagata, K., Oda, N., Kaisaki, P.J., Menzel, S., Furuta, H., Vaxillaire, M., Southam, L., Cox, R.D., Lathrop, G.M., Boriraj, V.V., Chen, X., Cox, N.J., Oda, Y., Yano, H., Le Beau, M.M., Yamada, S., Nishigori, H., Takeda, J., Fajans, S.S., Hattersley, A.T., Iwasaki, N., Hansen, T., Pedersen, O., Polonsky, K.S., Bell, G.I., et al. (1996). Mutations in the hepatocyte nuclear factor-1alpha gene in maturity-onset diabetes of the young (MODY3). *Nature*, 5; 384(6608):455-8.
13. Shukla Acharya Vidhyadhar and Tripathi Ravi Dutt. (2007). *Charak Samhita*, Vaidyamanorama vol 1, Chaukhambha Sanskrit Pratishthan, Delhi, C.S.Si.4/30-31.
14. Sharma Anant Ram. (2010). *Sushruta Samhita*, Susratavimarshini, Chaukhamba Prakashana, Varanasi, 1st edition. S.S.Su.24/5.
15. Boon Nicholas A., Davidson Sir Stanley. (2007). Davidson's Principles and practice of medicine. 20th edition, ch.21, p. 814-815.
16. Murthy, K.R. Srikantha. (2004). *Caraka Samhita*, with commentary of cakrapani data, Chaukhambha Orientalia, Varanasi, Vol 1, 1st edition. C.S.Ni. 4/8.
17. Boon Nicholas A., Davidson Sir Stanley. (2007). Davidson's Principles and Practice of Medicine. 20th edition, Publisher Churchill Livingstone Elsevier, Ch-21,p. 813.
18. Sharma Anant Ram. (2010). *Sushruta Samhita*, Susratavimarshini, Chaukhamba Prakashana, Varanasi, 1st edition, S.S.Su.35/24.

19. Shukla Acharya Vidhyadhar and Tripathi Ravi Dutt. (2007). *Charak Samhita*, Vaidyamanorama vol 1, Chaukhambha Sanskrit Pratishthan, Delhi, C.S.Su.18/51.
20. Shukla Acharya Vidhyadhar and Tripathi Ravi Dutt. (2007). *Charak Samhita*, Vaidyamanorama vol 1, Chaukhambha Sanskrit Pratishthan, Delhi, C.S.Su.17/117.
21. Math Ashtavaidyan Vaidyamadhom Cheriya Narayanan Namboodiri. (2007). *Astanga Hrdaya Samhita*, Sasilekha, Commentary of Indu, Chowkhamba Krishnadas Academy, Varanasi. 1st edition, A.H.Ni. 10/21.
22. Shukla Acharya Vidhyadhar and Tripathi Ravi Dutt. (2007). *Charak Samhita*, Vaidyamanorama vol 1, Chaukhambha Sanskrit Pratishthan, Delhi, C.S.Ni.4/6-8.
23. Boon Nicholas A., Davidson Sir Stanley. (2007). Davidson's Principles and Practice of Medicine. 20th edition. Publisher Churchill Livingstone Elsevier, Ch-21, pg no-812.
24. Shukla Acharya Vidhyadhar and Tripathi Ravi Dutt. (2007). *Charak Samhita*, Vaidyamanorama vol 1, Chaukhambha Sanskrit Pratishthan, Delhi, C.S.Ni.4/6.
25. Sharma Anant Ram. (2010). *Sushruta Samhita*, Susratavimarshini, Chaukhamba Prakashana, Varanasi, 1st edition, S.S.Ci. 11/3.
26. Sharma Anant Ram. (2010). *Sushruta Samhita*, Susratavimarshini, Chaukhamba Prakashana, Varanasi, 1st edition, S.S.Su.23/7.
27. Sharma Anant Ram. (2010). *Sushruta Samhita* Susratavimarshini Anant Ram Sharma, Chaukhamba Prakashana, Varanasi, 1st edition 2010. S.S.Su.23/7.
28. Shukla Acharya Vidhyadhar and Tripathi Ravi Dutt. (2009). *Charak Samhita*, Charak Samhita, Vaidyamanorama vol 1, Chaukhambha Sanskrit Pratishthan, Delhi, C.S.Ci.6/15.
29. Sharma Anant Ram. (2010). *Sushruta Samhita*, Susratavimarshini, Chaukhamba Prakashana, Varanasi, 1st edition, S.S.Ni.6/13
30. Boon Nicholas A., Davidson Sir Stanley. (2007). Davidson's Principles and Practice of Medicine. 20th edition, Publisher Churchill Livingstone Elsevier, Ch-21, p. 829.
31. Boon Nicholas A., Davidson Sir Stanley. (2007). Davidson's Principles and Practice of Medicine. 20th edition, Publisher Churchill Livingstone Elsevier, Ch-21, p. 821.
32. Kunte Anna Moreswar and Navare Krsna Ramachandra Sastri. (2011). *Astanga Hrdaya Samhita*, Sarvangsundra of Arundutta & Ayurvedarasayana of Hemadri (Ed.) Hari sadasiva sastri paradakara bhisagacarya, Chowkhamba Subharti Prakashan, Varanasi. 1st edition, A.H.Ni. 10/24.
33. Boon Nicholas A., Davidson Sir Stanley. (2007). Davidson's Principles and Practice of Medicine. 20th edition, Publisher Churchill Livingstone Elsevier, Ch-21, p.843.
34. Shukla Acharya Vidhyadhar and Tripathi Ravi Dutt. (2007). *Charak Samhita*, Vaidyamanorama vol 1, Chaukhambha Sanskrit Pratishthan, Delhi, C.S.ci.6/15
35. Boon Nicholas A., Davidson Sir Stanley. (2007). Davidson's Principles and practice of medicine. 20th edition, ch.21, p. 830.