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Original Research Paper

Ayurveda

AN AETIOPATHOLOGICAL STUDY ON DIABETIC NEPHROPATHY IN AYURVEDA WITH SPECIAL REFERENCE TO SOME LABORATORY PARAMETERS

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ABSTRACT Diabetic Nephropathy is one of the most long term complications in terms of mortality and morbidity for individual patients with diabetes. It is due to long standing diabetes mellitus and is characterized by persistent albuminuria associated with progressive decline in the Glomerular Filtration Rate and elevated arterial blood pressure. Though, there is no direct nomenclature of the disease mentioned in Ayurveda, but there are references of diseases with manifestation of symptoms suggestive of diabetic nephropathy. The present study aims at ruling out the possible aetiological factors responsible for developing diabetic nephropathy from an Ayurvedic perspective and establishing a relation between the aetiological factors in Ayurveda and some most sensitive tests. The study is performed in 60 patients of known and newly diagnosed cases of diabetic nephropathy in a specially designed proforma. After assessing all the Ayurvedic parameters, the aetiological factors-both dietary and lifestyle factors responsible are evaluated.

Keywords : Diabetic Nephropathy, Dietary Factors, Lifestyle Factors

INTRODUCTION:

Diabetic Nephropathy is the single most common cause of chronic renal failure in the united states, accounting for 45% of patients receiving renal replacement therapy and is rapidly growing problem worldwide.

Clinically it is characterized by persistent albuminuria that is confirmed on at least two occasions 3-6 months apart associated with progressive decline in the GFR and elevated arterial blood pressure. Appropriate correlation of diabetic nephropathy in Ayurveda is not mentioned. So,an approach has been made with the following to establish the possible aetiological factors responsible for developing Diabetic Nephropathy from an Ayurvedic perspective for a preventive and curative purpose.

MATERIALS AND METHODS:

A clinical study on 60 patients of Diabetic Nephropathy was conducted at Govt. Ayurvedic College and Hospital, Guwahati-14,Assam,India, as per necessary formalities under strict protocol to prevent bias and to reduce the error in the study. Detailed history regarding diet and lifestyle habits as mentioned in Ayurveda were taken in a specially designed proforma prepared for the study incorporating all relevant points. All subjective parameters were statistically evaluated using proper statistical tools.

ASSESMENT CRITERIA:

1. All selected patients were recorded as per specially design performa.
2. Selection of the patients were done based on prior history of diabetes mellitus or with a family history of diabetes mellitus.
3. All diabetic patients with increased serum creatinine level were undertaken for the study.
4. For assessment of excessive intake of specific food products, food frequency questionnaire for a period of seven days have been employed. Variation was done as follows—

a) Frequency of intake once in a month = 0
b) Once in a week=1
c) 2-3 times in a week=2
d) 4 times in a week= 3
e) 5 times in a week= 4
f) Everyday intake = 5

Fishes considered for the study are fresh water fishes, meat of commonly consumed birds/animals such as chicken , duck, pork, beef , pigeon, goat have been included in the study.Leafy greens considered for the study are the commonly available edible plant leaves in the north- eastern region. Milk of cow and buffalo milk is considered for the study. Chilli refers to intake of green chilli along with diet. Eggs laid by paultry and duck mainly is considered for the study.

Assessment of *viharaja nidanas* like *ativyayam*, *diwaswapna* and *avyayam* were done as per lifestyle and profession. Daily sleep at day time for more than 1 hour is considered as diwaswapna for the study. For better scientific evaluation of such lifestyle factors, energy intake per day is calculated out as follows:

BMR (female) = (weight in kg)×4.35+(height in cm)×4.7-(age in years)×4.7+655
BMR (male) = (weight in kg)×6.23+(height in cm)×12.7-(age in years)×6.8+66

To rule out activity level,
No activity=sedentary
Light activity=1-2 days/week
Moderate activity=3-5 days/week
Very active=daily

Activity factor:
For sedentary=1.2
For light=1.375
For moderate=1.55
For very active=1.725

Factor the BMR by the activity factor to give you the number of calories per day.

5. Data above 40% of occurrence rate have been taken into consideration for the study.

A. OBSERVATION AND STATISTICAL ANALYSIS

The data of subjective of adjective parameters were tabulated and analysed using appropriate statistical tools.

Table 1: Prevalence of *aharaja nidanas* in the study

	No. of observation	Percentage
Meat	35	57
Fish	50	84

Milk	23	38
Egg	8	13
Yogurt	8	13
Cheese	0	0
Honey	3	5
Mustard	12	20
Mushroom	0	0
Apple	3	5
Banana	3	5
Fruit juice	0	0
Guava	0	0
Mango	0	0
Papaya	0	0
Sauces	0	0
Vinegar	3	5
Turmarind	3	5
Tea	8	13
Pickles	4	7
Dosa idli	0	0
Amlavetas	0	0
dadim	0	0
Lemon	7	11
Broccoli	0	0
Capsicum	0	0
Spinach	10	16
Cabbage	0	0
Sweet potato	0	0
Pumpkin	16	27
Squash	0	0
Cucumber	0	0
Soda	4	6
Eggplant	3	5
Carrot	0	0
Beet root	0	0
Pizza	0	0
Tomato	9	16
Grapes	0	0
Cold drinks	0	0
Biscuit	3	5
Chips	0	0
Noodle cracker	3	5
Salad	1	2
Chat	0	0
Salt	33	56
Saindhav lavana	0	0
Rice	9	16
Maize	0	0
Cereals	0	0
Bread	1	2
Sugar	3	5
Sweets	3	5
Red chilli	39	65
Capsicum	0	0
Puri	0	0
Coriander	5	9
Garlic	31	51
Drumstick	12	20
Mint	0	0
Ginger	32	53
Mustard oil	4	7
Onion	25	42
Papad	1	2
Spices	4	7
Ghee	4	7
Mandak	0	0
Tikshna	0	0
Leafy greens	36	60
Guda	4	7

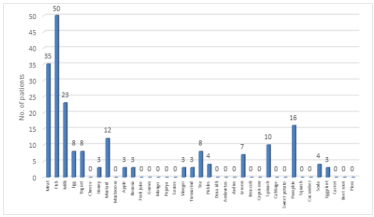

Fig. 3: Prevalence of aharaja nidanas in the study(n=60)

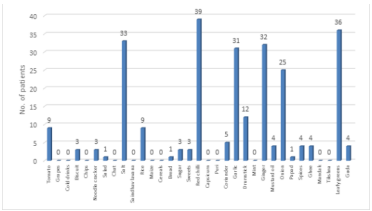

Fig. 4: Prevalence of aharaja nidanas in the study (n=60)

Study shows meat, fish, salt, red chilli, ginger, garlic and leafy greens as the most prevalent aharaja hetus (fig.3 & fig. 4)

Table 2: Prevalence of viharaja nidanas in the study

	No. of observation	Percentage
Abhojana	12	20
Rukshabhojana	5	9
Ajeernabhojan	4	7
Adhyasan	3	5
Ativyayam	12	20
Avyayam	0	0
Diwaswapna	31	51
Krodh	3	5
Bhaya	0	0
Soka	4	6
Chinta	29	49

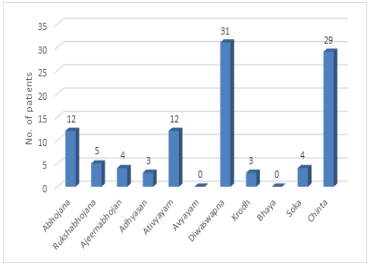

Fig. 5: Prevalence of viharaja nidanas in the study (n=60)

Study shows diwaswapna and chinta as the most prevalent among all the viharaja nidanas

DISCUSSION:

A. DISCUSSION ON AHARAJA NIDAN:

ANALYSIS ON AETIOLOGICAL FACTORS BASED ON FOOD HABIT:

Over 90 varieties of different food products were evaluated in a specially designed proforma to know the consumption rate of the same in a known case of diabetic nephropathy based on ayurvedic parameters. Study shows consumption of fish (84%) with the highest incidence rate followed by chilli (65%), leafy greens (60%), meat (57%), salt (56%), onion (42%), ginger (53%), garlic (51%) respectively. Here, the above dietary factors can be considered as viprakrista nidanas. Rest of the items with an incidence rate below 40% are considered as insignificant and hence not recorded as predominant in the study. These particular food items can be taken as vyabhichari nidanas in the study.

ANALYSIS ON FISH:

Fish occupies the highest predominance in the study with a considerably higher incidence rate of 84%. Fish consumption in the study has been considered as per the food consumption score with a score of 4 and 5 being taken into consideration for the study. River water fishes are termed as *nadeya matsya*[2] in classics .In context of *guna, karma, dosa* association with consumption of fish, Susruta mentions that fishes are guru, *snigdha, raktapittakara* and alpavarchasah[3]. Susruta considers, fishes typically river water fishes as mahaabhisyandi[4] i.e, it produces *kleda* in the *dosas, dhatu*,, mala and *srota*. In charaka's opinion, fishes are *guru,usna,,snigdha* and bohudosakara[5].As we know guru *guna* is *kaphavardhak* where as *snigdha* and *usna gunas* are pittakarak[6]. Hence, association of pitta and *kapha dosas* can be taken into consideration. In context of *dhatupradosaja vikaras*,it is been mentioned that guru and *snigdha gunas* are responsible for *rasa,rakta* and *mamsa* dusti[7] whereas *usna guna* is directly associated with *rakta dusti*[8]. In context of *mala*, Sushruta has considered fishes as alpavarchasah[3] i.e, it generates mala inside the body that can be related to increased production of excretory products or toxic metabolites inside the body. Hence, vitiation of pitta and *kapha dosa* along with rasa, *rakta* and *mamsa dusti* can be considered from the increased consumption of fish in the study.

The nutritional value of fish contains moisture 65-80%,protein 15-20%,fat 5-20%,ash 0.5-2%, Along with that it contains micronutrients that include fat soluble vitamins A,D,E,K as well as thiamine, niacin and riboflavin[9].Fish is a good source of protein. However receipt of these high protein diets may heighten diabetic patient's risk of developing impaired renal function. From recent studies it is known that incrementally higher animal protein consumption is strongly associated with increasingly higher risk of ESRD in a dose dependent manner[10]. This suggests improper consumption of protein rich foods such as fish may increase protein load in the body which in turn affect kidney in order to excrete protein derived nitrogen metabolites increasing glomerular filtration rate in a diabetic patients.

ANALYSIS ON MEAT:

Meat consumption (43%) also shows predominance significantly in the study. Meat consumption in these areas is apparently heterogeneous comprising of poultry,red meat,pork, beef, duck, pigeon, etc. As per charak samhita *kukkuta mamsa* is *snigdha*, *usna*[11]. Sushrutha has also considered it as snigdha, usna and guru[12]. However Charak has considered meat of *prasaha, bhusaya, anupa, varija* in general as *usna, snigdha*, kapahpittavardhak[13]. Again, *chagala mamsa* is considered to be *natisheeta, natiguru, natisnigdha* and hence *adoshakara* as per charak[14], whereas sushrutha defines *chagala mamsa as manda pitta kapha*[15] i.e, it slightly increases pitta and *kapha dosa*. Pork meat is described as snigdha and *guru* as per charak[16]. Sushruta has considered pigeon meat as rakatapitta prasamak and *guru*[17], whereas duck meat is considered to be *guru, usna, snigdha*[18]. Similar description has been put forwarded by charak as well. Careful analysis of the gunas attributed to the the different varieties of meat in the samhitas, indicates involvement of *pitta* and *kapha dosa* along with *rasa, rakta and mamsa dhatu dusti.*

The nutritional value of meat consist of roughly 75% water, 90% protein,2.5% intramuscular fat.1.2% carbohydrate and 2.3% other soluble non protein substance[19]. As mentioned earlier irrational indulgence of protein has got higher risk of occurrence of nephropathy, hence higher incidence rate of meat consumption among diabetic nephropathy patients can be taken into consideration in the study. Moreover, meat is again a good source of fats, which can be either adipose tissue or intramuscular fat. Example of foods containing a high proportion of saturated fats include animal fat products such as cream, cheese, butter and fatty meals which also contains dietary cholesterol. From recent studies, it has been established that hypercholesterolemia is considered to be one of the high risk factor for developing nephropathy[20]. Vascular lesions, where atheroma of renal arteries is considered to be very common and severe in diabetes mellitus patients and considered as one of the pathology involved in diabetic nephropathy. Hyaline arteriosclerosis is known to affect the afferent and efferent arterioles of glomeruli. Atherosclerosis is a specific form of arteriosclerosis where the major acquired risk factor is hyperlipidaemia[21]. Hence, consumption of of animal fat, mostly saturated fat in excessive manner connects a relationship in the occurrence of the disease Diabetic Nephropathy.

ANALYSIS ON LEAFY GREENS:

Leafy greens accounts for 60% of consumption among rest of the food items considered in the study. These contributes to the eating behaviour of people from this particular geographical distribution. Here, leafy greens indicate a heterogenous group of traditionally available plant leaves which are considered as food in this geographical area of north eastern region. Some of the common leafy greens which are consumed in this particular geographical area are spinach(spinacea oleracea,paleng), mustard plant(Brassica juncea, xoriyoh xak),mustard green(Brassica chinensis var. parachinensis, lai), Indian spinach(Basella alba, morisa), water spinach (Ipomoea aquatica, kalmou), fenugreek greens (Trigonella foenum graecum, methi xak), Green amaranth(Amaranthus viridis, khutura) .

In Ayurvedic treatises description of a wide variety of leafy greens are mentioned under *saka varga*. In Charak samhita, the general qualities of all the various groups of leafy greens that comes under *saka varga*, are considered as *guru*, *ruksha, vistambhi,* madhura rasa predominant and *sita* in *veerya*[22]. *Guru* and *vistambhi guna* is *kaphakarak* whereas *ruksha guna* vitiates *vata*[23]. Susruta opines that all varieties of *sakas* are *pittaghna* in general, *vatakarak* and mandakapha[24] i.e, it alleviates *kapha*. Moreover, as per Sushruta consumption leafy greens results in generation of mala and mutra. (*sristamutrapurishani*).

On average, the leafy vegetables contains proteins and fibres. Ca,Mg,Na and K are the most abundant minerals in the leafy meals and leaf protein concentrates, while P and Cu are the least abundant[25]. Prior data has shown that low dietary sodium intake is associated with reduction in blood pressure and proteinuria in Chronic kidney diseases patients, which may be extrapolated for diabetic kidney disease patients. Current nutritional guidelines for diabetic kidney disease patients uniformly recommend restriction of dietary sodium intake to less than 1.5-2.3 g/day. (5gm of sodium chloride)[26]. Hence, limiting sodium intake in a diabetic patient to prevent occurrence of nephropathy is well-established. Therefore, leafy greens which contain abundance of electrolytes as sodium, potassium etc. may have a relationship with nephropathy at a high consumption rate, by interfering with the normal functioning of the nephrones in a known case of diabetes mellitus.

ANALYSIS ON SALT:

Percentage of taking added salt with meal or consumption of salty food at a relatively higher rate is recoded as 56% among the given population selected to conduct the study. Affect of excess sodium consumption in a diabetic patient and it's relation with subsequent development of nephropathy has already been discussed in context of leafy greens[26]. Which is also evident from the study. On the other hand, Ayurveda has described lavana as *visyandi, sristamala, vataghna, paki and*

kaphapittakrita. *visyandi* guna[27] is related to the production of *kleda* in the *srotas* along with *kaphavriddhi*. *Lavana* itself is said to vitiate *kapha* and pitta *dosa*. Hence, salt intake in an excessive manner can be linked with the involvement of *kapha* and pitta *dosa* along with production of *kleda* in the *srotas*.

ANALYSIS ON SPICES:

Spices comprises of chilli, garlic ginger and onion in the present study. Different proportions of spices consumption have been recorded in the study, where chilli accounts for approx. half of the consumption i,e. 65% followed by ginger (53%), onion (42%), garlic (51%), respectively.

Chilli accounts for the habit of consuming fresh green chilli (capsicum annum) with food in the study. In Ayurveda an elaborate description regarding the *dosa* association, *guna* and Karma of green chilli could not be found. Biochemical composition of green chilli shows high pottasium level (95.5mg) which may be nephrotoxic if consumed excessively[28].

In context of gradation of onion intake,consumption of raw onion is taken into consideration for the study. Onion i.e, *Palandu* is mentioned to vitiate *kapha* along with pitta *dosa* in Charak samhita[29] whereas *Sushrutha* describes *Palandu* as *katurasatmak*, *tikshna* and guru *guna* pradhan[30]. Hence, involvement of pitta and *kapha dosa* can be considered. While analysing the nutritive values of onions, found to be low sodium and low pottasium in content[31]. Hence, can be considered to be wholesome to a patient of diabetic nephropathy. In the present study, the higher % of intake of onion may be due to the food habit of the geographical area.

In relation to intake of ginger and garlic, mixed consumption of ginger and garlic together is considered for the study. According to Charak, *ardrak* is *vrisya*, *deepaniya* and rochak[32]. it helps in alleviation of *vata* and *kapha* by the *prabhav* of it's rasa. Similar description could be found in Susrut Samhita as well. *lahsun* is considered as *snigdha*, *usna*,*katu* and *guru*[33]. *Snigdha* ,*usna and katu guna* vitiates pitta *dosa* whereas guru *guna* vitiates *kapha dosa*[34]. It is also considered as *krimikustha kilasaghna*, *vataghna* and *gulmanasak*[34]. Rakta dhatu along with *rasa* and *mamsa* can be taken into consideration due to excessive consumption of it alone[35]. Although, ginger and garlic shows some relation from the present data. But, from a recent study it is known that garlic and ginger attenuates the progression of structural nephropathy in experimental animals[36]. So, the relation of garlic ginger mixture with nephropathy could not be established in the present study.

Hence, the aetiological factors responsible for developing Diabetic Nephropathy from an Ayurvedic perspective that can be considered from the study are fish, meat, salt, leafy greens and spices like chilli and onion.

B. DISCUSSION ON VIHARAJA NIDAN:

Among the 11 lifestyle factors taken into consideration for the study, *diwaswapna* (51%) and *chinta* (49%) shows some prevalency, but due to their less influencial occurrence rate as compared with the other dietary factors ,their effect on the disease could not be justified. Out of 30 surveyed samples, 51% of the sample gave history of indulging in day sleep and among them most of the samples were having sleep in afternoon just after intake of lunch. The calorie intake/day for those patients is calculated out to be in the range of 45-50 kcal/kgbw/day. As per nkf-kdoqi guidelines and the international society of renal nutrition and metabolism recommend a total energy intake of 30-35 kcal/kgbw/day which should be tailored to physical activity level[37].

As the level of physical activity can be considered to be minimal in patients giving history of *diwaswapna* i.e, excessive day sleep, it can be assumed to be developing nephropathy in a diabetic patient.

As per Ayurveda, *diwaswapna* leads to increased *snigdhata* in the body and hence kapahakarak[38]. Again, *diwaswapna* is considered as one of the aetilogical factor responsible for *medovaha srota* dusti[39].

Similarly, studies suggest that long term stress can cause long term high blood glucose levels. Ayurveda mentions that excessive indulgence in *chinta*, *soka* etc[40]. Psychological stress leads to improper digestion of food and hence to the production of *ama* along with *rasavaha srota dusti*[41].

CONCLUSION:

1. The possible aetiological factors responsible for developing Diabetic Nephropathy from the study indicates both *aharaja* and *viharaja nidanas*. The *aharaja nidanas* relating to the disease in the study are found to be excessive consumption(i.e 4 to 5 days in a week) of fish (fresh water fishes), meat (commonly consumed in NE region), leafy greens (commonly available in NE region of India), salt (common salt), spices (chilli). The *viharaja nidanas* relating to the disease in the study are found to be excessive indulgence in *diwaswapna (daysleep) and chinta*(stress). These hetus can be considered as viprakrista hetus as per Ayurveda in the study.

Hence, the study indicates , for prevention of Diabetic Nephropathy, a patient of Diabetes Mellitus may avoid the excessive intake and indulgence of the above aetiological factors . Similarly , for a curative purpose of Diabetic Nephropathy the above aetiological factors can be taken into consideration from an ayurvedic perspective .

REFERENCES:

1. Harrison's principles of internal medicine,17th edition,VOL-II,published by MCGraw-Hill,Pg-1791,Ch-277
2. Sushruta Samhita of maharishi sushruta edited with Ayurveda tattva sandipika by kaviraj ambikadutta shastri published by Chaukambha sankrit sansthana,edition 2012,sutra sthan,chapter 46,verse no.112
3. Sushruta Samhita of maharishi sushruta edited with Ayurveda tattva sandipika by kaviraj ambikadutta shastri published by Chaukambha Sanskrit sansthana,edition 2012,sutra sthan,chapter 46,verse no.114
4. Sushruta Samhita of maharishi sushruta edited with Ayurveda tattva sandipika by kaviraj ambikadutta shastri published by Chaukambha sanskrit sansthana,edition 2012,sutra sthan,chapter 46,verse no.125
5. Charak samhita of agnivesha revised by Charaka and Dridhabal with the Ayurvedic deepika commentary of Chakrapani dutta and with Vidyotini hindi commentary by Kashinath sastri edited by Ganga Sahaya Pandeya,edition 2015,sutra sthan,chapter 27,verse no.82
6. Bhavprakash
7. Charak samhita of agnivesha revised by Charaka and Dridhabal with the Ayurvedic deepika commentary of Chakrapani dutta and with Vidyotini hindi commentary by Kashinath sastri edited by Ganga Sahaya Pandeya,edition 2015,viman sthan,chapter 5,verse no.13-15
8. Charak samhita of agnivesha revised by Charaka and Dridhabal with the Ayurvedic deepika commentary of Chakrapani dutta and with Vidyotini hindi commentary by Kashinath sastri edited by Ganga Sahaya Pandeya,edition 2015,sutra sthan,chapter 24,verse no.5-10
9. B.P.Mohanty,www.researchgate.net nutritional value of food fish
10. Www.ncbi.nlm.nih.govt(dietary approaches in the management of diabetic patients with kidney diseases)
11. Charak samhita of agnivesha revised by Charaka and Dridhabal with the Ayurvedic deepika commentary of Chakrapani dutta and with Vidyotini hindi commentary by Kashinath sastri edited by Ganga Sahaya Pandeya,edition 2015,sutra sthan,chapter 27,verse no.66
12. Sushruta Samhita of maharishi sushruta edited with Ayurveda tattva sandipika by kaviraj ambikadutta shastri published by Chaukambha sanskrit sansthana,edition 2012,sutra sthan,chapter 46,verse no.60
13. Charak samhita of agnivesha revised by Charaka and Dridhabal with the Ayurvedic deepika commentary of Chakrapani dutta and with Vidyotini hindi commentary by Kashinath sastri edited by Ganga Sahaya Pandeya,edition 2015,sutra sthan,chapter 27,verse no.57
14. Charak samhita of agnivesha revised by Charaka and Dridhabal with the Ayurvedic deepika commentary of Chakrapani dutta and with Vidyotini hindi commentary by Kashinath sastri edited by Ganga Sahaya Pandeya,edition 2015,sutra sthan,chapter 27,verse no.61
15. Sushruta Samhita of maharishi sushruta edited with Ayurveda tattva sandipika by kaviraj ambikadutta shastri published by Chaukambha sanskrit sansthana,edition 2012,sutra sthan,chapter 46,verse no.87
16. Charak samhita of agnivesha revised by Charaka and Dridhabal with the Ayurvedic deepika commentary of Chakrapani dutta and with Vidyotini hindi

commentary by Kashinath sastri edited by Ganga Sahaya Pandeya,edition 2015,sutra sthan,chapter 27,verse no.79
17. Sushruta Samhita of maharishi sushruta edited with Ayurveda tattva sandipika by kaviraj ambikadutta shastri published by Chaukambha sanskrit sansthana,edition 2012,sutra sthan,chapter 46,verse no.70
18. Sushruta Samhita of maharishi sushruta edited with Ayurveda tattva sandipika by kaviraj ambikadutta shastri published by Chaukambha sanskrit sansthana,edition 2012,sutra sthan,chapter 46,verse no.107
19. www.sciencedirect.com(meat composition and nutritional value)
20. Www.ncbi.nlm.nih.gov(lipids ,protein intake and diabetic nephropathy)
21. Textbook of pathology by harshmohan ,published by Jaypee brothers medical publishers,6th edition,chapter 22,pg 678
22. Charak samhita of agnivesha revised by Charaka and Dridhabal with the Ayurvedic deepika commentary of Chakrapani dutta and with Vidyotini hindi commentary by Kashinath sastri edited by Ganga Sahaya Pandeya,edition 2015,sutra sthan,chapter 27,verse no.103
23. Bhavprakash of SRIBHAVA MISRA ,edited with the Vidyotini Hindi Commentary,Notes and appendix by SRI BRAHMASANKAR MISRA and SRI RUPANJALI VAISHYA,purvardha,chapter 6,verse no.103
24. Sushruta Samhita of maharishi sushruta edited with Ayurveda tattva sandipika by kaviraj ambikadutta shastri published by Chaukambha sanskrit sansthana,edition 2012,sutra sthan,chapter 46,verse no.212
25. Chemical composition of common leafy vegetables and functional properties of their leaf protein concentrates(agris.fao.org)
26. Ko GJ,et al.nutrients.2017,Dietatry approaches in the management of diabetic patients with kidney diseases, www.ncbi.nlm.nih.gov
27. Dr.Brahmananda Tripathy,editor. Astanga Hridaya of Vagbhata,sutra sthana,chapter 6,verse 143, Chaukhamba Sanskrit Pratisthan
28. Nitesh S.litoriya,Jayant Talati,Nutritional composition of different chilli,www.researchgate.net
29. Charak samhita of agnivesha revised by Charaka and Dridhabal with the Ayurvedic deepika commentary of Chakrapani dutta and with Vidyotini hindi commentary by Kashinath sastri edited by Ganga Sahaya Pandeya,edition 2015,sutra sthan,chapter 27,verse no.175
30. Sushruta Samhita of maharishi sushruta edited with Ayurveda tattva sandipika by kaviraj ambikadutta shastri published by Chaukambha sanskrit sansthana,edition 2012,sutra sthan,chapter 46,verse no.246
31. https://en.m.wikipedia.org
32. Charak samhita of agnivesha revised by Charaka and Dridhabal with the Ayurvedic deepika commentary of Chakrapani dutta and with Vidyotini hindi commentary by Kashinath sastri edited by Ganga Sahaya Pandeya,edition 2015,sutra sthan,chapter 27,verse no.166
33. Charak samhita of agnivesha revised by Charaka and Dridhabal with the Ayurvedic deepika commentary of Chakrapani dutta and with Vidyotini hindi commentary by Kashinath sastri edited by Ganga Sahaya Pandeya,edition 2015,sutra sthan,chapter 27,verse no.176
34. Bhavprakash of SRIBHAVA MISRA ,edited with the Vidyotini Hindi Commentary,Notes and appendix by SRI BRAHMASANKAR MISRA and SRI RUPANJALI VAISHYA,purvardha,chapter 6,verse no.103
35. Charak samhita of agnivesha revised by Charaka and Dridhabal with the Ayurvedic deepika commentary of Chakrapani dutta and with Vidyotini hindi commentary by Kashinath sastri edited by Ganga Sahaya Pandeya,edition 2015,sutra sthan,chapter 24,verse no.5-10,Viman sthan,verse no.13-15
36. Khaled –al-qattan,muslim ali, https://doi.org/10.106/j.eclnm.2007.12.001,garlic and ginger attenuate structural nephropathy progression in streptozocin induced diabetic rats.
37. G ko,K Kalantar-Zadeh.J Goldstein-Fuches,C Rhee-nutrients,2017-mdpi.com,www.ncbi.nlm.nih.gov,dietary approaches in the management of diabetic patients with kidney disease.
38. Dr.Brahmananda Tripathy,editor. Astanga Hridaya of Vagbhata,sutra sthana,chapter 7,verse 55, Chaukhamba Sanskrit Pratisthan
39. Charak samhita of agnivesha revised by Charaka and Dridhabal with the Ayurvedic deepika commentary of Chakrapani dutta and with Vidyotini hindi commentary by Kashinath sastri edited by Ganga Sahaya Pandeya,edition 2015,viman sthan,chapter 5,verse no.16
40. Charak samhita of agnivesha revised by Charaka and Dridhabal with the Ayurvedic deepika commentary of Chakrapani dutta and with Vidyotini hindi commentary by Kashinath sastri edited by Ganga Sahaya Pandeya,edition 2015,viman sthan,chapter 2,verse no.9
41. Charak samhita of agnivesha revised by Charaka and Dridhabal with the Ayurvedic deepika commentary of Chakrapani dutta and with Vidyotini hindi commentary by Kashinath sastri edited by Ganga Sahaya Pandeya,edition 2015,viman sthan,chapter 5,verse no.13