Original Article

Indian Journal of Ancient Medicine and Yoga
Volume 7 Number 1, January - March 2014

A Comparative Clinical Study on the Efficacy of *Navaka Guggulu* and *Amritadya Guggulu* in the Management of *Sthaulya* (Overweight and Obesity)

S.A.U.S.K. Jayasiri*, S.M.S. Samarakoon**

Abstract

Obesity is a medical condition in which excess body fat has been accumulated in different parts in the body mainly in the subcutaneous tissues. It has an adverse effect on health and leads to reduced life expectancy as well as increased health problems. The world Health Organization has identified obesity as a global epidemic. The term "*Sthaulya*" is described in Ayurveda for "Over weight and Obesity". This study was undertaken to identify the efficacy of *Navaka Guggulu* and *Amritadya Guggulu* which are mentioned in *Bhaishajya Ratnawali* in the treatment of *Medoroga*. Thirty overweight and obese patients were selected from Gampaha Wickramarachchi Ayurveda Teaching Hospital, Sri Lanka and randomly divided into two groups. Group A was treated with *Navaka Guggulu* and Group B with *Amritadya Guggulu*, 1g twice a day for a period of two months. *Navaka Guggulu* reduced mean body weight, abdomen circumference, mid-thigh circumference and mid arm circumference and mean BMI in statistically highly significant manner ($p<0.001$). *Amritadya Guggulu* reduced mean body weight, abdomen circumference, mid-thigh circumference and mid arm circumference and mean BMI in statistically highly significant manner ($p<0.001$). The improvement in excessive thirst, drowsiness, digestive capacity were statically highly significant ($p<0.001$). Finally, it could be concluded that both the drugs have more or less similar effect in improving some subjective and objective parameters of overweight and obesity.

Key words: *Sthaulya; Navaka guggulu; Amritadya guggulu;* Obesity.

Introduction

Obesity is a medical condition in which excess body fat has accumulated to the extent that it may have an adverse effect on health, leading to reduced life expectancy and increased health problems. Body mass index (BMI), a measurement which compares weight and height, defines people as overweight (pre-obese) if their BMI is between 25 and 30 kg/m^2, and obese when it is greater than 30 kg/m^2. Obesity is the most common nutritional disorder not even in affluent societies but even in middle class change in the dietary habits, behavioral pattern and sedentary life may be the most probable cause for this disease. The world Health Organization has identified obesity a global epidemic. Indeed, its prevalence is increasing worldwide at alarming rates in adults and children. This marked and rapid increase in the prevalence of obesity is found in affluent countries, in countries in economic transition and in developing countries.

Obesity is most prevalent in middle-age, but can occur at any stage of life. Obesity in childhood and adolescence is likely to be followed by obesity in adult life. Fat increases in both sexes after puberty and during adult. Hyperplastic obesity in adult is extremely difficult to treat with conventional methods. Between age 20 and 50, fat content of men approximately doubles and those of women increase by about 50 percent.

Normally, the women are more prone to be obese than men. The young women contain fat approximately 15% of body weight and it is about more than young man. In that phase

Author's Affiliation: *Intern-Medical Officer; **Senior Lecturer, Department of Chikitsa, Gampaha Wickramarachchi Ayurveda Institute, University of Kelaniya, Yakkala, Sri Lanka.

Reprint's Request: Dr. S.M.S. Samarakoon, Senior Lecturer, Department of Chikitsa, Gampaha Wickramarachchi Ayurveda Institute, University of Kelaniya, Yakkala, Sri Lanka.

E-mail: samarakoonsms@yahoo.com

(Received on 16.09.2013, accepted on 04.10.2013)

of puberty and adolescent due to hormonal changes more fat accumulates in body particularly in females. In the Framingham USA study, men were found to gain most weight between the ages of 29 and 35 years, while women gain most between 45 and 49 years of age.

There is clear inverse relationship between socio–economic status and obesity. Within some affluent countries however, obesity has been found to be more common in the lower socio-economic groups. In developing countries it can occur only in the prosperous elite. After so many surveys, it is observed that the increased prevalence of obesity is seen in middle and lower and upper socioeconomic classes respectively. Therefore, it is evident that the prevalence of obesity is not related with quantum of money but it depends upon faulty eating habits and life style. The most convenient foods such as biscuits, bread are the preparation of fat and sugar. Urban population constantly consumes these foods, along with this urban population also reduces the need for physical exercise. These trends increase energy intake and decrease energy output also leads to obesity.

The term "*Sthaulya*" is described in Ayurveda for the "Obesity". It refers the overweight in comparison to the minimum required standard but *Medorogas* term is used for the group of diseases caused by the obesity. Overweight (BMI>25) is a major determinant of many NCDs including NIDDM, CHD and stroke and it increases the risk of several types of cancer, gallbladder disease, musculoskeletal disorders and respiratory symptoms. In some populations, the metabolic consequence of weight gain start even at modest levels of overweight. Healthy young man and women have a total body fat content below 20% and 25% respectively. When excess calories are supplied in any form, they are stored as fat. A person having BMI higher than 30 is considered as obese.

Sthaulya is a predominant metabolic disorder. It is described by Charaka in *Ashtaunindita Purusha*. He categorized this problem under *Santarpanajanita Vyadhi.* According to it eight kinds of persons are despicable such as over-tall, over-short, over-hairy, over-hairless, over-black, over-fair, over-weight and over-lean. *Sthaulya* (over-weight) is caused by over-saturation intake of heavy, sweet, cold and fatty diet, indulgence in day-sleep and exhilaration, lack of mental work and genetic defect. Obese person is said to suffer from the following eight defects; *Ayurhasa, Javoparodha, Alpa-vyavayita, Daurbalya, Daurgandhya, Swedabadha, Ati-trisha, Ati-kshudha.* According to Charaka Samhita, the *dhatu* (body tissues) get disequilibrium due to several complications. Therefore Ayurveda has a principal that the weak *agni* (the metabolic agent) plays a major role as a cause of many diseases. The *sthaulya* is one of them, which leads to the *sroto-avarodha* (blocking in to micro channels of the body) that causes different complications and may shorten the life span.

Bhsaishajya Rathnavali emphasized the uses of the *Navaka Guggulu* and *Amritadya Guggulu* which is claimed effective for the *sthaulya*. In the present Study *Navaka Guggulu* and *Amritadya Guggulu* are taken for Clinical trial which are quoted from *Bhaishajya Ratnawali Medoroga Chikitsa* (39/43). It mainly contains drugs like *Sunthi, Marich, Pippali, Chitraka, Haritaki, Bibhitaki, Amalaki, Musta, Vidanga, Amritha, Ela, Vatsaka, Kalinga and Shuddha Guggulu.* Almost all the drugs are having *Katu rasa, Laghu Ruksha guna, Ushna virya, Katu vipaka* and *Kapha Vata Shamaka* properties which may be helpful in disintegrating the *Samprapati* of Sthaulya. These showed encouraging results in reduction of weight, skin fold thickness, body circumference and associated signs and symptoms.

Materials and Methods

Objective of the Study

The objective of the study was to assess the efficacy of *Navaka Guggulu* and *Amritadya Guggulu* in the management of obesity.

Study Design

The study was a randomized clinical trial. Thirty overweight and obese patients were selected from Gampaha Wickramarachchi Ayurveda Teaching Hospital, Yakkala and randomly divided equally into two groups. Group A and Group B was treated with *Navaka Guggulu* and *Amritadya Guggulu* each one (01g) two times a day respectively. The duration of treatment was two months (02).

Inclusion Criteria

Thirty (30) overweight (BMI > 25kg/m^2) and obese patients (BMI > 30kg/m^2) of both sexes, aged between 25-60 were selected for the study.

Exclusion Criteria

Patients above 60 years, previously known cardiovascular diseases, thyroid diseases, diabetes, hypertension (blood pressure >90/ 140mmHg), renal impairment (serum creatinine > 120 ì mol/l) and patients were on any long term medications for at least 6 months prior to the study were excluded from the study.

Methodology

Both Ayurveda and modern medical texts were referred to find out information regarding *Sthaulya* and Obesity, *Navaka Guggulu* and *Amritadya Guggulu.* The test drugs were prepared as per guidelines given in *Bhaisajya Rathnavali* at the pharmacy of Gampaha Wickramarachchi Ayurveda Institute (GWAI). The selected patients were subjected to careful history taking by using specially prepared research questionnaire and patients were assessed by subjective and objective parameters before and after treatment. Finally, data was analyzed by using SPSS software (Paired-sample T Test).

Preparation of Drugs

Raw materials of both drugs were procured from M. D. Peiris Limited, Gabo's lane, Pettah, Colombo. They were authenticated macroscopically at the pharmacy of GWAI, University of Kelaniya.

Table 1: Ingredients of *Navaka Guggulu*

Ingredients	Ratio	Weight
Shunti (Zingiber officinalis)	1 part	200 g
Maricha (Piper nigrum)	1 part	200 g
Pippali (Piper longum)	1part	200 g
Chitrakamula (Plumbago zeylanica)	1 part	200 g
Haritaki (Terminalia chebula)	1 part	200 g
Vibhitaki (Terminalia bellirica)	1 part	200 g
Amalaki (Emblica officinalis)	1 part	200 g
Mustaka (Cyperus rotundus)	1 part	200 g
Vidanga (Embelia ribes)	1 part	200 g
Shuddha Guggulu (Commiphora mukul)	9 part	1800 g

Table 2: Ingredients of *Amritadya Guggulu*

Ingredients	Ratio	Weight
Amrita (Tinospora cordifolia)	1 part	100 g
Ela (Elettaria cardemomum)	2 part	200 g
Vidanga (Embelia ribes)	3 part	300 g
Vatsaka (Holarrhena antidysenterica)	4 part	400 g
Kalinga (Holarrhena antidysenterica)	5 part	500 g
Haritaki (Terminalia chebula)	6 part	600 g
Amalaki (Emblica officinalis)	7 part	700 g
Shuddha Guggulu (Commiphora mukul)	8 part	800 g

Table 3: Treatment Procedure for Two Groups

Group	Group A	Group B
Drug	*Navak Guggulu*	*Amurtadi Guggulu*
Dosage	2 pills (500mg×2) 2 times a day (10 a.m/4p.m)	2 pills (500mg×2) 2 times a day (10 a.m/4p.m)
Anupana	Warm water	Warm water
Duration	08 weeks (2 Months)	08 weeks (2 Months)

Shodhana Procedure of Ingredients

All contaminated foreign particles of raw materials were removed and washed well and dried under the sunlight for three days. Dried raw materials were stored in paper bags under the room condition. A purification method (*Shodana karma*) was applied for the unpurified *Guggulu* and *Chitraka. Guggulu* and *Chitraka* was purified as per classical references.

Results

The 80%of patients were female whereas 20% were male. On religion wise distribution, 93.33% patients were Buddhist and 6.66% were Christians. The majority of patients (43.33%) were having Advanced level education whereas 36.66% had ordinary level education. Another 20% were graduated. The maximum patients (53.33%) were house wives. Staff assistants were 6.66% of patients. Computer instructors, Labourers, library attendants and businessmen were in minor percentage (3.33% each). In this comparative study, 30 patients of Sthaulya *were registered equally in group A and group B. It was found that maximum number of patients (30.98%) was belonged to the age group of 36 – 45, whereas 23.56% in the age group of 25-35. Regarding the socio-economic status, it was evident from the study that maximum i.e. 50.35% patients were belonging to middle classes and 5.45% patients were to lower middle class. It is evident that majority (68.71%) of patients was married and in the same way, 31.29% of the patients were unmarried. It was reported in the symptomatology that 100 % patient were having excessive weight, while 68.18 % heaviness of the body, 54.54 % dyspnoea on exertion, 65.45 % excessive hunger, 61.82% pendulant body parts, and 54.55 % excessive thirst. The maximum number of patients 98% had mixed dietary habit whereas 2% had vegetarian dietary habits. It was also revealed that 62.93 % patients were used to take excessive* Madhura Rasa *whereas 24.24%* Amla Rasa *and 11.21%* Lavana Rasa *in their regular diet. The above table shows that maximum 46.23 % patients were not doing any type of exercise in their daily routine while 28.13 % were doing exercise on and off. Only 7.23 % had a habit of regular exercising. It was observed that maximum 61.21 % female were having regular menstrual cycle whereas 33.79 % irregular menstrual history, only 7 % were menopaused. It was also highlighted that maximum i.e. 79% patients having* Vata- Kapha Prakriti, *and 11% patients having* Pitta Kapha Prakriti *while 10% were* Vata Pitta Prakriti. *Maximum 43.45 % patients were having BMI between 25-30 kg/m^2 and 34.33% patients were having BMI between 30-35 kg/m^2 while 46.33% patients were having BMI between 35-40 kg/m^2. Approximately 64% of the patients were engaged in occupations which are both mental and physical labour dominant. Another 33.33% patients had mental labour dominant occupations.*

Effect of the Therapy of Navaka Guggulu

In *Navaka Guggulu* treated group, the initial Serum cholesterol (4.18%) and serum triglyceride (10.33%) level was decreased but they were statistically insignificant. The initial serum HDL level was increased by 0.65% and fasting blood sugar by 0.49, but both of them were statistically insignificant. The mean weight was 73.43kg was reduced to 66.27 % kg by 7.16 % which was statistically highly significant ($p<0.001$). The mean BMI was 31.50 was decreased to 29.58 % kg/m^2 by 2.70 % which was statistically highly significant ($p<0.001$). Considering on body

circumferences, reduction was noticed in mid thigh circumferences (6.87 %), Abdomen circumference at naval level (5.78%), mid leg circumference (4.65 %), mid arm circumference (4.42 %), Hip circumference (2.57%), mid forearm circumference (2.32 %) and Chest circumference (2.26 %). Among them, Chest circumference, mid thigh circumference and mid leg circumference were statistically highly significant ($p<0.001$) whereas abdominal circumference, hip circumference and mid arm circumference were statistically significant ($p<0.01$), while mid forearm circumference was statistically insignificant ($p>0.05$).

Improvement in oiliness of body parts (100%), weakness (64.29%), laziness and reduces exercise capacity (each 50 %), body pain (40.91 %), bad smelling of the body (40%), pendulant muscles, excessive sweating (each 33.33%), excess body fat (29.17 %), dyspnoea on exertion (28.57 %), drowsiness (17.39 %) and excessive thirst (15.38 %), and in excessive hunger (3.45%) was observed, whereas digestive capacity was decreased by 8.33%. The improvement in excessive body fat and pendulant muscles were statistically insignificant ($P>0.05$). The significant result ($p<0.01$) was found in weakness and body pain while no change was observed in dysponoea on exertion, ex. sweating, bad smelling of the body, ex. thirst, ex. hunger, oiliness of the body, drowsiness and digestive capacity. Finally, 33.33% patients acquired *mild* improvement and 26.67% patients got *moderate* improvement (26.67%), whereas 6.67% acquired marked improvement and 33.33% patients remained unchanged.

Effect of the Therapy of Amritadya Guggulu

In *Amritadya Guggulu* treated group, reduction observed in FBS (5.75%), S. Tryglyceride (13.28%), *no* apparent changes were observed in Serum cholesterol and Serum HDL. All were found to be statistically insignificant. Reduction in weight was 3.03 % and in BMI was 2.95 %, both the results were statistically highly significant ($p<0.001$). Decrease observed in various body circumferences i.e mid thigh circumference (11.22%), mid arm circumference (5.34%), mid leg circumference (4.64%), mid forearm circumference (3.84%), abdominal circumference (3.74%), chest circumferences (2.14%) and hip circumference (2.41%). The reduction in chest circumference, abdominal circumference, hip circumference, mid leg circumference and mid arm circumference were statistically highly significant ($p<0.001$), whereas in mid thigh circumference, and mid forearm circumference were statistically insignificant ($p>0.05$).

Improvement in bad smell of the body (75.61%), dyspnoea in exertion (59%), excessive sweating (57.34%), digestive capacity (46.47%), weakness (48.49%), glossiness of the body (52.56%), drowsiness (39.58%), body pain (46.47%), pendulant body parts (36.53%), laziness and physical inactivity (32.48%), excessive body fat (31.55%), excessive thirst (24.52%) and excessive hunger (4.44%) was observed. The improvement in excessive thirst, drowsiness, digestive capacity were statically highly significant ($p<0.001$) whereas excessive body fat, body pain were statically significant ($p<0.01$). The improvement in weakness, bad smell of the body, and excessive hunger were statistically insignificant ($p>0.05$). The eight patients who were treated with Navaka Guggulu *acquired mild improvement (31.58%), seven patients moderate improvement (26.73%), and three patients were remained unchanged (10.43%).*

Discussion

Sthaulya (Overweight and Obesity) according to Charaka Samhita is due to increased *Jataragni* which causes maximum ingestion and leads to maximum absorption of *Prithivi* and *Jala Mahabhuta* dominant factors in the body leading to increased *Medodhatu* in the body. Clinical features of *Sthaulya* are 28 in number according to various *ayurveda* classics. Most of the symptoms are related to abundant growth of *Medodhatu* in the body. Most of the symptoms of *Sthaulya* occur due to excessive accumulation of *Meda* in fat depots

leading to *Chalatva* of the various organs, *Kshudra shwasa, Anga gauravata* and other various signs and symptoms.

In the pathogenesis of *Sthaulya, Tikshna* state of *jataragni* occurs, whereas *Medodhatvagni* is found in diminished condition. It is due to *Avarana* of *Vayu* in the *Koshta*. Then, the person indulges more food, which produce excessive *Meda*. This cycle is broken by the drugs having *Katu-Rasa* & *Ushna-Virya. Navaka Guggulu* decreases *Meda* by its *Lekhana, Shoshana* and *Kaphanashaka* properties, *Kaphanashaka* properties due to *Agni* and *Vayu Mahabhuta* dominance in them. In this study *Amritadya Guggulu* was selected along with *Navaka Guggulu* to compare the effect of both drugs in the treatment of *Sthaulya.*

The majority of patients (30.98 %) belonged to age group of 36-45 and 23.56% patients belonged to 25-35 age group, which means *Madhya-awastha* or middle age (According to Charaka between 30-60 year of age) is more prone to obesity and reaching to *Paripurnata* in all *Dhatus* take place during this age. Maximum patients (80%) were female, because have a tendency to develop fatty mass. Modern medical texts support this observation. In young women, body fat stores may be below 30 percent and increase gradually to more than 35% in older women whereas in men it increases up to 25% only. In every region the prevalence of Obesity is higher among women than men. The reason behind this observation might be the feminine factors like pregnancy, post operating condition, use of oral contraceptives, menopause etc. were predominant factors, which makes female an obese. The majority of patients (43.33%) had advanced level education whereas 36.66 % had ordinary level education. It can be concluded that education has a role in the pathogenesis of obesity. The majority of patient (50.35%) are from middle class, whereas 5.45% patients from lower middle class. Peoples from middle class are affluent and can afford rich food. On the other hand, they are more prone to have sedentary life style both of which lead to *Sthaulya.* Maximum patients registered in the study (53.3%) were housewives meaning housewives are more prone to develop obesity. The reason for this might be sedentary nature of work, use of more electrical appliances in their daily household work which reduces use of calories and besides these one of the important cause is sleeping at day time. All these lead them to *Sthaulya*. Regarding the symptoms, all most all patients had excessive weight, while 68.18 % heaviness of the body, 54.54 % dyspnoea on exertion, 65.45 % excessive hunger, 61.82% pendulant body parts, and 54.55 % excessive thirst. In *Sthaulya,* increased *medodhatu*, is the root cause of increment of weight. This increased weight is the cause for dyspnoea on exertion. The maximum number of patients (98%) had mixed dietary habit whereas 2% had vegetarian dietary habits. It was also revealed that 62.93 % patients were used to take excessive *Madura rasa* whereas 24.24% *amla rasa* and 11.21% *lavana* rasa in their regular diet. Diet with animal products such as milk, egg and meat enriched with excessive fat and protein which leads *Sthaulya. Madhura, amla* and *lavana rasa* and *snigdha, guru guna* aggravate *kapha* and *meda* which lead to *sthaulya* as per *samanya siddhanta.*

It shows that maximum 46.23 % patients were not doing any type of exercise in their daily routine while 28.13 % were doing exercise on and off. Only 7.23 % had a habit of regular exercising. Due to insufficient physical activities and sedentary life style reduced energy consumption by the body compared to energy intake that tends to obesity. It was observed that maximum (61.21 %) female were having regular menstrual cycle whereas 33.79 % irregular menstrual history, only 7 % were menopaused. It showed that changes in female hormones play certain role in pathogenesis of obesity. It was also highlighted that maximum (79%) patients have *Vata- Kapha Prakriti*, and (11%) patients having *Pitta Kapha Prakriti.* This indicates that *Kapha* is a possible risk factor for *Sthaulya.*

Effect of Navaka Guggulu

The initial Serum cholesterol and serum

triglyceride level was decreased but they are statistically insignificant (p>0.05). The serum HDL level and fasting blood glucose level was increased, both of them are statistically insignificant (p>0.05). The mean weight was reduced which was statistically highly significant (p<0.001). The mean BMI was decreased which was statistically highly significant (p<0.001). The reduction was noticed in all most all selected body circumferences, chest circumference, mid-thigh circumference and mid leg circumference were statistically highly significant (p<0.001) whereas abdominal circumference, hip circumference and mid arm circumference were statistically significant (p<0.01), while mid forearm circumference was statistically insignificant (p>0.05). By fore going, It may be concluded that combination of *Katu-Rasa, Laghu, Ruksha* and *Ushna-Virya, Katu-Vipaka* of *Navaka Guggulu* reduces *Kapha* and *Meda. Navaka Guggulu* may be effective on *Meda, agni*, and *Kapha* which provided good results in all signs and symptoms.

Effect of Amritadya Guggulu

Amritadya Guggulu reduction in FBS, Serum Triglyceride, Serum Cholesterol and Serum HDL are statistically insignificant (p>0.05). Reduction in body weight and B.M.I was statistically highly significant (p<0.001). The reduction in chest circumference, abdominal circumference, hip circumference, mid leg circumference and mid arm circumference were statistically highly significant (p<0.001).

Improvement in bad smell of the body, dyspnoea in exertion, excessive sweating, digestive capacity, weakness, glossiness of the body, drowsiness, body pain, pendulant body parts, laziness and physical inactivity, excessive body fat, excessive thirst and excessive hunger was observed. The improvement in excessive thirst, drowsiness, digestive capacity were statically highly significant (p<0.001) whereas excessive body fat, body pain were statically significant (p<0.01). The improvement in weakness, bad smell of the body, and excessive hunger were statistically insignificant (p>0.05). Amritadya Guggulu *acts against* Vata *and* kapha *by its* Katu rasa, Ushna Virya *and* Vata hara *action is also achieved by* Laghu guna. *Due to its* Laghu, Ruksha, Ushna, Tikshna guna*, it intencifies* medodhatvagni *and unmasks* avarana *of* Vata *by* meda *by which bring* jatharagni *to its normal state.*

Conclusion

The mean weight was reduced which was statistically highly significant (p<.0.001). The mean BMI was decreased which was statistically highly significant (p<0.001). The reduction was noticed in all most all selected body circumferences, chest circumference, mid thigh circumference and mid leg circumference were statistically highly significant (p<0.001). In *Amritadya Guggulu* reduction in body weight and B.M.I was statistically highly significant (p<0.001). The reduction in chest circumference, abdominal circumference, hip circumference, mid leg circumference and mid arm circumference were statistically highly significant (p<0.001).

The improvement in excessive thirst, drowsiness, digestive capacity were statically highly significant (p<0.001) whereas excessive body fat, body pain were statically significant (p<0.01). The mode of action of Navaka Guggulu *and* Amritadya Guggulu *is more or less similar to that of when considering their pharmaco-therapeutic properties.* Navaka Guggulu *contains drugs having* lekhana *properties and* Amritadya Guggulu *also contains the drugs having same e properties. In* Navaka Guggulu*, ingredients possess* Katu Rasa, Laghu, Ruksha Guna, Ushna Virya *and* Katu Vipaka, *which sharpens the* agni. *Thus, both the drugs regulate* Jatharagni, *check the excessive growth and accumulation of* medodhatu *and thereby* sthaulya *is improved.*

References

1. Alagiyawanna, Puwasati. Alagiyawanna Sanskrit-Sinhala Dictionary. Maradana, Colombo, Sri Lanka: Sooriya Publishers; 2004.
2. Ayurveda Pharmacopoeia. Volume 1, Part one. Colombo, Sri Lanka: Department of Ayurveda;

1976.

3. Bhisagratna, Govinda Dasji. Bhaisajya Ratnavali, Volume II. Varansi, India: Chaukhambha Sanskrit Bhawan; 2006.
4. Buddhadasa R. Cakradatta. Colombo: Anula Printers; 1962.
5. Ganavimala, Bellana Tero. Sanskrita Sabdarnava (Part Two). Maradana, Colombo, Sri Lanka: S Godage and Brothers; 1999.
6. Jayaweera, DMA. Medicinal plants used in Ceylon. Colombo, Sri Lanka: The National Science foundation; 2006.
7. Michael, Swash and Michael, Glynn. Hutchison's Clinical Methods. London: Elsevier Science Limited; 2007.
8. *Osuthuru Visithuru*. Volume 1. Colombo, Sri Lanka: Department of Ayurveda; 1994.
9. Sharma, PV. Cakradatta. Sanskrit text with English Translation, 3rd Edition. Varanasi, India: Chaukhambha Publishers; 2002.
10. Sharma, RK and Dash, Bhagwan. Caraka Samhita, Volume I. Varanasi, India: Chowkhamba Sanskrit Series Office; 2005.
11. Sharma, RK and Dash, Bhagwan. Caraka Samhita, Volume II. Varanasi, India: Chowkhamba Sanskrit Series Office; 2003.
12. Sharma, RK and Dash, Bhagwan. Caraka Samhita, Volume III. Varanasi, India: Chowkhamba Sanskrit Series Office; 2004.
13. Sri Bhavamisra. Bhavaprakasa, 11th Edition. Varansi, India: Chaukhambha Sanskrit Bhawan; 2007.
14. Srikantha Murthy, KR. Susruta Samhita (English Translation). Varanasi, India: Chowkhamba Orientalia; 2005.
15. Srikantha Murthy, KR. Astanga Hradayam (English Translation), Part one. Varanasi, India: Chowkhamba Krishnadas Academy; 2004.
16. Srikantha Murthy, KR. Astanga Hradayam (English Translation), 5th Edition, Part two. Varanasi, India: Chowkhamba Krishnadas Academy; 2003.
17. Srikantha Murthy, KR. Astanga Hradayam (English Translation), Part three. Varanasi, India: Chowkhamba Krishnadas Academy; 2005.
18. Thomas, CL. Taber's Cyclopedic Medical Dictionary, 18th Edition. Philadelphia: FA Davis Company; 1993.
19. Tirtha, Swami Sada Shiva. The Ayurveda Encyclopedia. Delhi, India: Sri Satguru Publishers; 1998.