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CASE REPORT

The effect of Bhavitha Sigru patra choorna (Triturated powder of leaves of *Moringa oleifera* Lam.) in Hypertension with Hyperlipidemia – A case report

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Abstract

Background: Hypertension is one of the major health-related risk factor in India and Hyperlipidemia serves as one of its main causes. These two diseases are the most common non-communicable diseases and primary controllable factors that contribute to the development of cardiovascular diseases. They are often referred to as "silent killers" because they can go unnoticed until they become life-threatening. Unfortunately, awareness and easily accessible treatments for these diseases are still very low in India.

Case presentation: A 48-year-old man presented with asymptomatic and newly diagnosed hypertension. Initial evaluation through haematological, serological tests and systemic examination demonstrated hyperlipidemia as a secondary cause in this case. Collected data suggested the absence of any cardiovascular, renal, liver, endocrinal, and neurological disorders. *Bhavitha Sigru patra choorna* capsule (each of 500mg) was given as an intervention at a dose of 2 capsules twice daily (2gm/day) for 12 weeks. Assessment of systolic and diastolic blood pressure was done before treatment, after first week, second week, third week, fourth week, eighth week, and after twelfth week. Assessment for lipid profile was done before treatment, and after every fourth week till completion of intervention period.

Conclusion: The case highlights the effect of the easily available, assessable, cost-effective and *shaka varga* drug *Sigru Patra* as a single drug therapy for the management of two associated clinical conditions, hypertension with hyperlipidemia. The study drug *Bhavitha Sigru patra choorna* was significantly effective in reducing blood pressure and lipid profile parameters of hypertensive patient with hyperlipidemia.

Introduction

Hypertension, also referred to as high or raised blood pressure occurs when blood flows through blood vessels at a consistently elevated force. [1] Various causes that lead to hypertension include Renal disorders like glomerulonephritis, polycystic kidney, renal artery stenosis, renal vasculitis, and uropathy. Endocrinal disorders like thyroid dysfunction, acromegaly, primary hyperaldosteronism, pheochromocytoma and cushing syndrome.

Cardiovascular disorders like atherosclerosis, rigidity of aorta, polyarteritis nodosa, increased cardiac output and total peripheral resistance. Metabolic disorder like hyperlipidemia, diabetes, and Neurological disorders. [2],[3],[4],[5],[6] Certain risk factors contributing to hypertension includes genetic factors, old age, smoking, alcohol, obesity, stress, physical inactivity and complications of drugs like oral contraceptives, steroids, NSAIDs, and sympathomimetic agents. [7] Among these hyperlipidemia is a major cause as well as risk factor leading to hypertension.

Hyperlipidemia is a lipid metabolism disorder characterised by elevated lipid levels in blood. [8] Hypertension and hyperlipidemia both are metabolic disorders and major modifiable risk factors for cardiovascular diseases, estimating 1.6 million deaths in India annually. [9] The Prevalence of hypertension in Kerala is 38.6% among males, and 31.4% of females, Out of which 48.7% males and 46.7% females are found to be hyperlipidemic also.[10] Hyperlipidemia serves as one of the main causes of hypertension as unprocessed lipid molecules deposit on the periphery of the artery, thus increasing total peripheral resistance and leading to hypertension.

Awareness of these diseases in India is low while appropriate treatment and control are even lower. Combination therapy of antihypertensive and antihyperlipidemic drugs is usually prescribed in hypertension with hyperlipidemia. However none of the systems of medicine could claim complete management of these diseases. The drug *Sigru patra* is botanically identified as leaves of *Moringa oleifera* Lam., which is an edible *shaka* and possesses *katu* and *tikta rasa*, *laghu* and *ruksha guna, katu vipaka, ushna virya, deepana, pachana, amahara, medohara and hridya* action.[11] Various experimental studies on *Moringa oleifera* leaves and its extracts have significantly proven antihypertensive and hypolipidemic actions. *Bhavana* (trituration) is a pharmaceutical process done to potentiate and purify drugs and induce additional therapeutic property. *Sigru patra choorna* (leaf powder) was given seven times *bhavana* (trituration) with *Sigru patra swarasa* (fresh juice) to form study drug *Bhavitha Sigru patra choorna* (triturated leaf powder) and used as single drug therapy in these two associated diseases. This case report describes the effect of cost-effective, easily available, assessable and *shaka varga* drug *bhavitha sigru patra choorna* in hypertensive patient with hyperlipidemia.

Materials and methods

Preparation of drug

Sigru patra choorna was prepared according to the reference of *sharangadhara*, [12] by collecting leaves in *Varsha rithu* (rainy season) in the month of July and August. Then leaflets were separated from the petiole and rachis, then washed with clean water and kept on a clean mat for drying under shade for 8 days. On the 9th day, dried leaves were kept under the sun for 3 hours, and as soon they became crispy it was ground in a mixer to form powder. Then powder was sieved with mesh size 85 to obtain *Sigru patra choorna*. Then *Sigru patra choorna* was subjected to 7 times *bhavana* with *Sigru patra swarasa*. For preparing *swarasa*, *Sigru patra* were collected, leaflets were separated, then thoroughly washed with clean water and grinded in a mixer to form a paste. Paste was taken on a clean muslin cloth, and squeezed to extract *swarasa* (fresh juice). *Bhavana* was given according to the reference of *Bhaishajya ratnavali.* [13] *Sigru patra choorna* was uniformly spread in a clean plastic tray, and *Sigru patra swarasa* was poured over it until it got completely absorbed, then tray was covered with a thin cloth and kept in sunlight during the day time and under shade during the night. The same process was repeated for consecutive 7 days and after completely drying again grinded and sieved by mesh size 85 to form the study drug *bhavitha sigru patra choorna*. Then *bhavitha choorna* was filled in gelatin capsules, each capsule containing 500mg of choorna. These capsules were given to patient for clinical trial.

Methodology

Selection of patient

Adequate patient visited OPD, which was applicable as per trail and ready to participate in trail was selected.

Blood pressure (BP) assessment was done through manual mercury sphygmomanometer according to Hypertension assessment guidelines. Blood pressure (BP) was measured in a relaxed state after the patient had been seated for 5 minutes with their arm at the level of their heart and their legs uncrossed. An auscultation method was used, and the cuff was initially inflated to 30 mmHg above the point where the radial pulse disappeared. The cuff was then deflated at a rate of 2-3 mmHg per second. The first starting korotkoff sound was taken as systolic BP and last audible Korotkoff sounds was taken as diastolic BP. Two readings were taken at 5-minute intervals, and the lower of the two readings was recorded as the patient's BP. [14] When found to be in the inclusion criteria of hypertension, a lipid profile test was followed to diagnose hyperlipidemia under the inclusion criteria. Then LFT (liver function test), TFT (thyroid function test), and RFT (renal function test) were done in the laboratory and Random blood sugar was checked through a manual digital glucometer to check for any other secondary cause of hypertension. After ensuring

the diagnosis of hypertension with hyperlipidemia, *bhavitha sigru patra choorna* capsules were provided to the patient through OPD after taking informed consent. This was a single arm trial in which pre, intermediate and post-treatment evaluation of participants was done to study the effect of the study drug on hypertension with hyperlipidemia.

Case presentation

1. Patient information

A 48-year-old married man residing in a rural area, belonging to a lower-middle class family, completed secondary education and working as a gardener came to the outpatient department for regular blood pressure monitoring. He was having no symptoms but had high blood pressure when checked one week prior. The blood pressure of the patient was measured twice with an interval of five minutes by manual mercury sphygmomanometer and a lesser reading was noted (138/94 mmHg). Medical history revealed that he had bilateral clubbing of feet by birth, had been operated on for an inguinal hernia eight years back and was taking Ayurveda medication – Murivenna (Local application) for back pain. No other acute or chronic illness was present. Dietary history revealed that the food pattern was regular having a mixed diet cooked in coconut oil. He used to drink alcohol occasionally (60-90 ml, twice or thrice a month). He had never taken any medication for hypertension or hyperlipidemia and was a freshly diagnosed case. The patient was socially active, conscious and oriented. He had a positive family history of hypertension, as his elder brother is a known case of hypertension under medication. The patient was advised for lipid profile test, and when found to be in inclusion criteria Haematological assessment of renal function, liver function, and thyroid function tests were done.

2. Clinical findings

Physical examination of the patient revealed vitals like Spo2: 99%, pulse rate: 95/min, respiratory rate: 16/min, weight: 53kg, height: 5 feet 4 inches, body mass index (BMI): 19.70 kg/m2, random blood sugar (RBS): 106mg/dl, and temperature: 98.4 ^{0}F. Laboratory investigations show liver, renal, and thyroid function tests were in the normal range. Lipid profile investigation showed elevated levels of total cholesterol: 208mg/dl, triglycerides: 288mg/dl, LDL-cholesterol: 140mg/dl, VLDL-cholesterol: 37mg/dl, and HDL-cholesterol: 33mg/dl. During the clinical examination, there were no vascular bruits detected in the carotid and subclavian arteries. Heart sounds were audible and clear, and bilateral lungs were clear. Abdominal auscultation revealed no audible renal vascular bruits. The pulsations of both the radial artery and dorsal artery of the feet were found to be regular and symmetrical. Signs and symptoms of sleep apnea, primary hyperaldosteronism, and pheochromocytoma were absent. No other abnormal clinical findings were detected for appetite, sleep, bowel, and micturition. The patient had no history of any known allergy nor prone to any other addiction. All other systemic investigations including urinary, cardiovascular, respiratory, digestive, and nervous systems were normal, which suggested it was a freshly diagnosed case of hypertension with hyperlipidemia.

3. Therapeutic intervention

After explaining the condition to the patient, we discussed the available treatment options for managing hypertension with hyperlipidemia, upon his approbation, we started the pharmacological intervention with *bhavitha sigru patra choorna* capsule (500mg each), at a dosage of 2gm daily in divided doses. He was advised to take 2 capsules twice a day with lukewarm water, after consuming his meals, for a period of 12 weeks along with consumption of a standard diet. He was assessed with objective parameters of blood pressure by manual sphygmomanometer as per guidelines of MOHFW Government of India, and lipid profile by laboratory test during regular intervals. Assessment of systolic and diastolic blood pressure was done after first, second, third, fourth, eighth, and twelfth week. Assessment of total cholesterol, triglycerides, LDL-cholesterol, and VLDL-cholesterol was done after the fourth, eighth and, twelfth week of starting the medicament. To ensure proper commencement of dose, the counting pill method was used on every follow-up.

Observation

The counting pill method shows that the patient has taken medicine at the proper time and in the correct dose, as he consumed 28 capsules each week, so a total of 336 capsules were consumed by him during complete treatment period of 12 weeks. Periodic assessment of blood pressure and lipid profile showed a significant reduction in systolic BP, diastolic BP, total cholesterol, triglyceride, LDL-cholesterol, and VLDL-cholesterol of the patient. The patient was diagnosed with stage 1 hypertension before treatment, with a BP reading of 138/94. A reduction in systolic BP was observed within the first week of treatment, while a reduction in diastolic BP was first observed in the second week after taking the medication. BP reduced and fell in the pre-hypertensive stage after third week, and after eighth week BP came to normal range. After the complete treatment period systolic BP was 116 mmHg and diastolic BP was 80 mmHg.

Before treatment, total cholesterol (208 mg/dl) and LDL-cholesterol (140 mg/dl) were in the borderline high range, whereas triglycerides (288 mg/dl) and VLDL-cholesterol (37 mg/dl) levels were considerably high. Reduction in all parameters was observed after 4 weeks, Total cholesterol, LDL-cholesterol, and VLDL-cholesterol came in the normal range after the 8th week. All four assessment parameters of lipid profile came to normal range and significantly reduced as compared to before treatment, after completion of full 12 weeks of medicament.

Assessment of Blood pressure

Blood pressure [mmHg]	Before treatment	After 1st week	After 2nd week	After 3rd week	After 4th week	After 8th week	After 12th week
Systolic	138	132	130	130	126	120	116
Diastolic	94	94	92	90	90	84	80

Assessment of Lipid profile

Lipid profile [mg/dl]	Before treatment	After 4th week	After 8th week	After 12th week
Total cholesterol	208	202	190	122
Triglyceride	288	200	152	90
LDL-cholesterol	140	138	116	84
VLDL-cholesterol	37	33	18	14

DISCUSSION

Here we discuss about probable mode of action of *Sigru patra* in Hypertension and hyperlipidemia. These both are metabolic disorder mainly caused due to improper eating habits and lifestyle changes which results in *agnimandhya* (vitiation of digestive power), leading to *rasa dhatu dushti* and *rasavaha sroto dushti*. *Moola sthana* of *rasavaha srotas* are *hridaya* and *dhamani*.[14] *Hridaya* (heart) and *dhamani* (artery) are responsible for *rakta samvahan* (transportation of blood) and *meda* (lipids) are one among constituents of blood. *Moola sthana* for *raktavaha srotas* are *yakrit* (liver) and *pleeha* (spleen), and for *medovaha srotas* are *vrikka* (kidneys) and *vapavahana* (omentum).[14] Liver is responsible for formation of cholesterol[15] and kidney is responsible for secretion of renin hormone,[16] which controls blood pressure. So hypertension with hyperlipidemia can be correlated with *rasavaha, raktavaha*, and *medovaha srotodushti*.

The drug *Sigru patra* (leaves of *Moringa oleifera* Lam.) possess *katu, tikta, madhura rasa*, *laghu, ruksha, tikshna guna, katu vipaka*, and *ushna virya*.[11] *Katu rasa* have *agni deepana*[17] (kindles digestive fire), pachana [18] (digest excess *meda*), *medasa uphanti* [18] (removes excess *meda*) and *vivranoti srotamsi* [17] (alleviates *srotodushti*) properties. *Tikta rasa* works as *deepana* and *medovasamajja upsoshanam* (dries excess *meda*).[19],[20] *Madhura rasa* is *preenanam* [21] (pleases heart), and *indriyani prasadayati* [21],[22] (pleases sense organs), which helps in palatability of drug. *Laghu guna* of *Sigru patra* is *sheeghra paki* (digest and absorbs fast), *kaphaghna* (alleviates *kapha*), *pathya* (condusive)[23], and helps in *lekhana*[24] (scrapping *meda*). *Ruksha guna* has *shoshana Shakti*[25] (dries *meda*), and *param kapha haram*[26] (best in alleviating *kapha*) properties. *Teekshna guna* helps in *lekhana* (scraps *meda*), and *kapha vata haram* (alleviates *kapha* and *vata*)[27]. *Ushna virya* is *Vata-kapha samaka* (alleviates *vata* and *kapha*), and *asupaki* (digests and acts fast)[28]. *Katu vipaka* is *laghu* in nature so works by virtue of these *gunas* [29]. Experimental studies on *Moringa oleifera* leaves and its extracts have proved its antihypertensive activity by working as adrenaline receptor blockers[30], blocking calcium channels[31], and by inhibiting action of angiotensin converting enzyme (ACE)[32]. Antilipidemic activity was proven by working as HMG-CoA reductase inhibitors[33], bile acid sequestrants[34], and triglyceride synthesis inhibitors [35]. Phytoconstituents present in *Moringa oleifera* leaf such as niacin, quercetin, tocopherol, kaempferol, and arginine have experimentally proven to have anti-hypertensive and antilipidemic actions.

In addition to therapeutic benefits *Moringa oleifera* Lam. leaves are rich source of nutrients like vitamins, proteins, fibers, and essential elements like iron, calcium, potassium, zinc, and magnesium.[36] These elements are necessary for human body to carry vital physiological functions. Where combinations of medicines are required for different parameters of single disease, *Sigru patra* as a single drug has potential in management of multiple parameters of hypertension with hyperlipidemia.

Conclusion

The administration of *bhavitha sigru patra choorna* capsule at dose of 2 gm daily in divided dose (1gm twice daily after meal) with lukewarm water was significant in reducing blood pressure and lipid profile value to a normal range in a hypertensive patient with hyperlipidemia. BP was reduced from 138/94 mmHg to 116/80 mmHg. Total cholesterol was

reduced from 208 mg/dl to 122 mg/dl, triglycerides were reduced from 288 mg/dl to 90 mg/dl, LDL-cholesterol was reduced from 140 mg/dl to 84 mg/dl, and VLDL-cholesterol was reduced from 37 mg/dl to 14 mg/dl. The drug's mode of action is likely due to its rasa (*katu* and *tikta*), *guna* (*laghu, ruksha,* and *tikshna*), *virya* (*ushna*), *vipaka* (*katu*), and *Karma* (*kapha-vata samaka, deepana, pachana, hridya*, *medohara*). The study drug *bhavitha Sigru patra choorna* was significantly effective in reducing blood pressure and lipid profile parameters of patient to a normal range. It can be state that, *Sigru* is a cost effective, easily available, and assessable *shaka varga dravya*, capable of treating hypertension with hyperlipidemia and additionally works as nutrient supplement.

Patient perspective

Patient and his family was very happy and satisfied with the treatment, assessment and follow up, as he was relieved from hypertension with hyperlipidemia at the end of study period.

Ethical consideration

Patient was given full details about trail and informed consent was obtained from patient, prior to beginning of trail. Ethical clearance (no. 02/DG/IEC/2022, dated 10/08/2022) was obtained from the Institutional Ethics Committee of Government Ayurveda College, Tripunithura.

Conflict of interest

None

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