



## Review Article

## Understanding hypertension in the light of Ayurveda

Maanasi Menon<sup>a</sup>, Akhilesh Shukla<sup>b,\*</sup><sup>a</sup> Dept of Kayachikitsa, Amrita School of Ayurveda, Clappana P.O., Kollam Dist, Kerala, 690525, India<sup>b</sup> Dept of Samhita, Siddhanta, Govt. Ayurveda College, Bilaspur, Chhattisgarh, 495001, India

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## ABSTRACT

Different theories have been proposed to explain hypertension from an *Ayurvedic* perspective, but there is no consensus amongst the experts. A better understanding of the applied physiology and etio-pathogenesis of hypertension in the light of *Ayurvedic* principles is being attempted to fill this gap. A detailed review of available *Ayurvedic* literature was carried out to understand the physiology of blood pressure and etio-pathogenesis of hypertension from the perspective of *Ayurveda*. Many parallels were drawn from the concepts such as *Shad Kriyakala* (six stages of *Dosha* imbalance) and *Avarana* of *Doshas* (occlusion in the normal functioning of the *Doshas*) to the modern pathogenesis of hypertension to gain a deeper understanding of it. Hypertension without specific symptoms in its mild and moderate stages cannot be considered as a disease in *Ayurveda*. It appears to be an early stage of pathogenesis and a risk factor for development of diseases affecting the heart, brain, kidneys and eyes etc. Improper food habits and modern sedentary lifestyle with or without genetic predisposition provokes and vitiates all the *Tridoshas* to trigger the pathogenesis of hypertension. It is proposed that hypertension is to be understood as the *Prasara-Avastha* which means spread of vitiated *Doshas* from their specific sites, specifically of *Vyana Vata*, *Prana Vata*, *Sadhaka Pitta* and *Avalambaka Kapha* along with *Rakta* in their disturbed states. The *Avarana* (occlusion of normal functioning) of *Vata Dosha* by *Pitta* and *Kapha* can be seen in the *Rasa-Rakta Dhathus*, which in turn hampers the functioning of the respective *Srotas* (micro-channels) of circulation.

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## 1. Introduction

In this modern era of specialties and super-specialties in medical care, *Ayurveda* stands out by its holistic approach towards the body as one single entity. The body with all its parts co-existing with interdependence and mutual interaction makes it difficult to comprehend when approached separately. In recent times, humanity has begun to realize this holistic approach to health with the multidimensional aspects of body, mind and soul [1] preached by *Ayurveda* ages ago. In the present times, life has been made easy for man with modernization every step of the way, but he has also paid for it by becoming prey to many lifestyle diseases. The diseases occur due to his faulty life style and stressful psychological conditions. These factors affect one's mind and homeostasis of the body by several psychosomatic mechanisms and lead to many lifestyle

diseases such as diabetes and hypertension. As per World Health Organization report, about 40% of people aged more than 25 years had hypertension in 2008 [2]. Hypertension is directly responsible for 57% of all stroke deaths and 24% of all coronary heart disease (CHD) deaths in India [3]. It is the most potent risk factor for diseases of the brain, kidney, heart and peripheral arteries which may prove fatal if not managed effectively [4]. Hypertension is a silent killer because most sufferers (85%) are asymptomatic [5]. In 95% of the cases of hypertension, the exact underlying causes are still unknown [6] but is believed to be due to genetic and environmental factors [7].

Hypertension cannot be considered as a *Vyadhi* (disease) as per *Ayurveda* but it can be understood by assessing the involved *Doshas*, *Dooshyas* (entity which is affected by morbid *Dosha*), *Srotas* etc. Many *Ayurvedic* scholars have proposed different theories about how hypertension can be understood in *Ayurveda*, but there is no standardized and widely accepted view about the *Ayurvedic* pathogenesis of this condition. There are still many controversies related to this disease in *Ayurveda*. Thus, this is an attempt to

\* Corresponding author.

E-mail: [an2akhilesh@gmail.com](mailto:an2akhilesh@gmail.com)

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thoroughly understand hypertension and interpret it in terms of Ayurvedic principles, considering all the existing views.

## 2. Previous theories – Ayurvedic view

Various Ayurvedic scholars have coined different names for hypertension such as: *Raktagata Vata*, *Siragata Vata*, *Avrita Vata*, *Dhamani Prapurana*, *Rakta Vikshepa*, *Vyana Prakopa*, *Raktamada*, *Uchharaktachapa*, *Vyana Atibala* etc. [8]. In each of these terms, different points of view have been adopted, but no one has denied the fact that in hypertension, the main pathogenesis occurs in *Rakta* along with the blood vessels. This being the only factor in common, many previous authors have given separate views on the Ayurvedic pathogenesis of this condition. As modern science is well advanced in understanding hypertension, we must understand all that is known about this disease and suitably correlate it to Ayurvedic principles for better understanding.

## 3. Concept of blood pressure in Ayurveda

At first, it is essential to understand the physiological aspects of blood pressure in Ayurveda which is fundamentally based on the theory of *Tridosha* [9]. The blood first ejected out of the heart, is then distributed to all parts of the body, and, thereafter, is returned back to the heart through the blood vessels termed as '*Sirah*' in Ayurveda [10]. This return of *Rasa* (blood) towards heart is controlled by the function of *Samana Vata* [9,11]. As it is known, blood pressure is the lateral pressure exerted by the flow of blood on the walls of the arteries [12]. The two components of blood pressure are the systolic and diastolic blood pressure [13]. The heart has its pacemaker (SA node) that generates electrical impulses on its own, which makes the heart contract during the systole. This self-excitatory function of the heart can be attributed to the functioning of the *Vata Dosha*, in particular the *Vyana Vata* as it is seated in the heart and is responsible for blood circulation [9,14]. Charaka clearly describes that *Vyana Vata*, a component of *Vata Dosha* constantly forces the blood out of the heart and distributes it [9,15]. Thus it can be said that the systolic BP attained during contraction of the heart is controlled by *Vata* (*Vyana Vata*). Though the SA node generates impulses on its own, the rate of its impulse generation is controlled by the autonomic nervous system via sympathetic and para-sympathetic nerve fibers emerging from the brain. It is the *Prana Vata* situated in the *Moordha* (Brain) [Ashtanga Hridaya, Sutra Sthana, 12/4] that controls the *Hridaya* (heart) and does *Dhamani Dharana* (arterial perpetuation) [16] and thus heart rate is controlled by *Prana Vata*. In this context it can be understood as *Vyana Vata* and *Prana Vata* denote the nervous control of circulation because *Vata*, in general, denotes all neural mechanisms [9,17]. The diastole is attained when the heart muscles relax. Here, diastolic blood pressure is only due to blood flowing through the narrow structures of the chambers of the heart and arteries and there is no active push by the heart. Thus diastolic BP can be taken under the domain of *Kapha Dosha* (*Kapha* maintains the structural integrity of body organs), mainly the *Avalambaka Kapha* [Ashtanga Hridaya, Sutra Sthana, 12/15] because it is the resistance offered by the structure of the heart and the blood vessels that controls the diastolic blood pressure. Thus the peripheral resistance (faced by blood in the blood vessels) determines the diastolic BP. This is mainly influenced by the diameter and elasticity of the blood vessels which can be considered under the purview of *Kapha Dosha*. The vascular tone is also controlled by the autonomic nervous system which alters the diameter of the arteries as and when required [18]. As *Dhamani Dharana* is a function of *Prana Vata* [Ashtanga Samgraha, Sutra Sthana, 20/2], the peripheral resistance offered by the arteries due to vasoconstriction caused by

sympathetic action of nerves can be understood as a function of *Prana Vata*. The Auto-rhythmicity of the heart is due to the action potential created by the rapid influx of  $\text{Na}^+$  and  $\text{Ca}^{++}$  ions and efflux of  $\text{K}^+$  ions across the membrane of the SA node [19]. The involvement of these chemical ions can be taken under the purview of *Pitta* due to its *Tikshna* (rapidity) *Drava* (fluidity) and *Sara* (diffusion/dispersion) *Guna*, [Ashtanga Samgraha, Sutra Sthana, 1/26] mainly *Sadhaka Pitta* situated in the heart. The basal metabolic rate (BMR) has a direct but imperfect positive correlation with the pulse rate and pulse pressure of the heart [20]. This is on the basis of Read's and Gale's formulae [21,22]. This means to say that variations in the basal metabolic rate cause changes in blood pressure as well. Thus the basal metabolic rate can be understood as a result of the action of *Agni* or *Pitta*, more precisely, *Pachaka Pitta* [Ashtanga Hridaya, Sutra Sthana, 12/10–12]. The blood volume and viscosity can be determined by the quality and quantity of the *Rasa* and *Rakta Dhatus*. These also determine the cardiac output. The heart (*Hridaya*) and the blood vessels (*Rasavaha Dhamanis*) form the *Prana Vaha Srotas* and their *Srotomulas* which are mainly involved in the blood circulation [23] along with that *Medavaha Srotas*, *Mutarvaha Srotas*, *Swedavaha srotas* and *Udakavaha Srotas* play an important role. Thus the *Doshas*, *Dhatus* and *Srotas* involved in the blood pressure have been discussed.

## 4. Blood pressure regulation and the role of Tridosha

Blood Pressure in the body is regulated by multiple mechanisms. Short-term Neural mechanisms and Long-term Renal, Hormonal and Local vascular mechanisms [9].

Short term mechanisms include the Nervous mechanism controlled by the vasomotor center of the brain via autonomic stimulation through Baro-receptor and feedback of Chemoreceptors [24,25]. This CNS regulation of Blood pressure can be understood mainly as a *Vata* function, typically *Prana Vata* (taking the help of *Kapha* in case of Baro-receptors and *Pitta* in case of Chemoreceptors).

Long term regulation of blood pressure is by:

- 1) Pressure Diuresis and Pressure Natriuresis – Kidneys excrete water and sodium through urine (*Kleda nirvahanam*) [Ashtanga Samgraha, Sutra Sthana, 19/20] to bring down the blood volume to regulate the blood pressure. This mechanism can be attributed to elimination of *Kapha* in the form of *Kleda* by the function of *Apana Vata* [Ashtanga Samgraha, Sutra Sthana, 20/2]
- 2) Renin-Angiotensin Mechanism – The Kidneys secrete Renin in response to low blood pressure as a result of which Angiotensin II is secreted to bring about vasoconstriction along with defective sodium and water homeostasis and thereby increasing blood pressure [26]. This can be attributed to the function of *Pitta*.
- 3) Hormonal regulation of Blood pressure: There are about 15 different hormones secreted which can create variations in the blood pressure. They are Adrenalin, Nor-Adrenalin, Thyroxin, Aldosterone, Vasopressin, Angiotensins, Serotonin, Bradykinin, Prostaglandins, Histamine, Acetylcholine, Atrial Natriuretic Peptide etc. [27].

All these being chemical substances causing regulation of blood pressure, may come under the purview of *Pitta Dosha*.

- 4) Local mechanism of BP regulation at the blood vessel level- There are local vasoconstrictors like endothelins and local vasodilators like  $\text{CO}_2$ ,  $\text{H}^+$  ions, Lactate, Adenosine and Nitric oxide which cause change in peripheral resistance thus influencing the BP [28]. This again can be understood as a function of *Pitta*.

Thus, the role played by the *Tridoshas* in regulation of blood pressure has been discussed.

**5. Etiological risk factors related to hypertension**

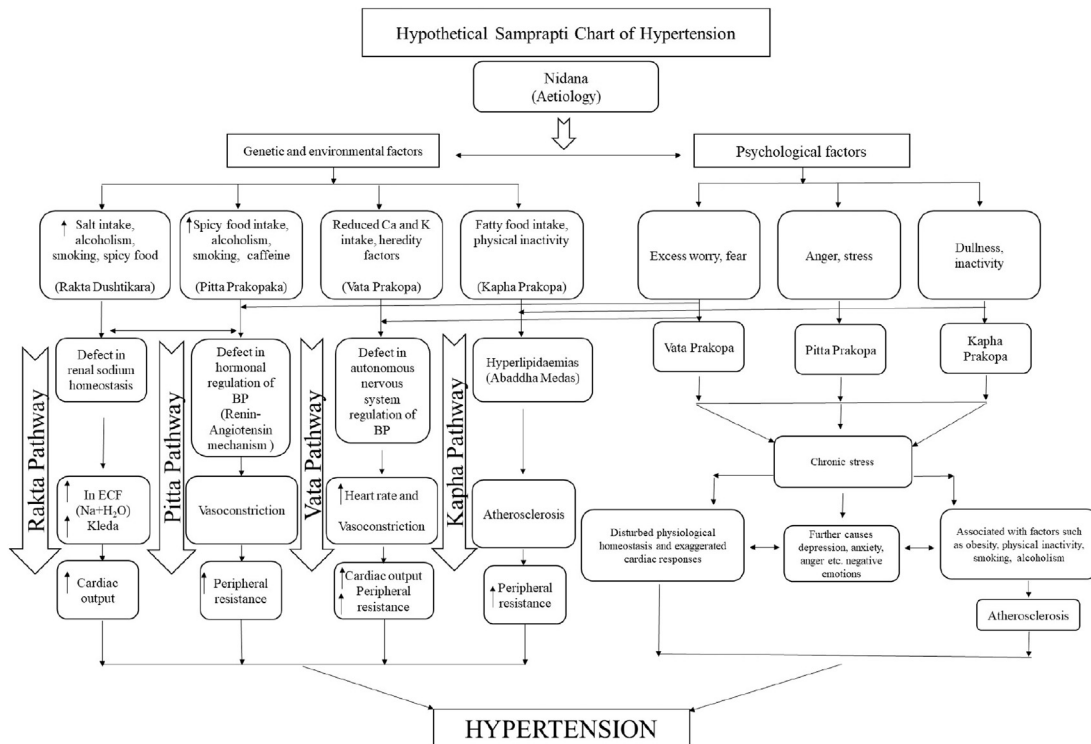
By definition, the causes of essential hypertension are unknown but many genetic and environmental factors and their mutual interactions act as risk factors for the development of this condition [7]. These factors are: high salt and spicy food intake, alcohol consumption and use of tobacco, low Calcium and Potassium intake, psychological stress, heredity, intake of fatty food which causes obesity and hyperlipidemia leading to atherosclerosis in blood vessels and physical inactivity (sedentary lifestyle) [29]. Among these, high salt and spicy food, alcohol consumption, use of tobacco, low Calcium and Potassium intake and psychological stress may vitiate *Pitta*, *Vata* and *Rakta*, while physical inactivity, dullness and habitual intake of fatty foods are *Kapha* and *Medo-wardhaka Nidanas* (etiological factors increasing fat) [Charaka Samhita, Sutra Sthana, 21/4]. Family history (heredity) is due to *Beeja dosha* (genetic defects). Most of these *Nidanas* are mentioned together as *Rakta Dusti Karana* by Charaka in the *Vidhishonitiya Adhyaya* [Charaka Samhita, Sutra Sthana, 24/5–10] and in the context of *Pittaja Hridroga* [Charaka Samhita, Sutra Sthana, 17/32].

**6. Pathology of hypertension in Ayurveda based on the modern view**

Essential hypertension is defined as chronic elevation in arterial blood pressure (BP) > 140/90 mmHg with no definable causes [30]. The various genetic and environmental factors mentioned earlier interact with each other and influence the pathogenesis of this condition. The main determinants of blood pressure as seen earlier are the cardiac output and peripheral resistance. Cardiac output is determined by the stroke volume and heart rate [31]. So, for

increase in blood pressure, there should be increase in either cardiac output or peripheral resistance. This happens when due to the influence of risk factors one or more of the different regulatory mechanisms of blood pressure gets hampered causing the blood pressure to increase. Defects in renal Sodium homeostasis causes decreased Na excretion leading to increased salt and water retention [32]. This increases the plasma and extra cellular fluid thus increasing the cardiac output. This is one mechanism which leads to hypertension. This may be understood as the pathology due to *Dooshana* (vitiating) of *Pitta* and *Rakta* due to *Ati Katu & Lavana Rasa sevena* (excess intake of pungent and salty items) [Charaka Samhita, Chikitsa Sthana, 4/6]. The other mechanism is increased functional vasoconstriction due to impaired hormonal actions leading to increased peripheral resistance [33]. This may be understood as *Pitta Dushti* due to endocrinal defects. Impaired functioning of the autonomic nervous system causing rise in blood pressure may be seen as *Dushti of Vata*. *Sushruta* has mentioned that *Vata Dooshita Rakta* (blood vitiated by *Vata*) is both *Sheeghra gama* (fast moving) and *Askandi* (hemodilution) [Sushruta Samhita, Sutra Sthana, 14/21]. Both these factors lead to changes in peripheral resistance. Hemodilution increases cardiac output [34] and *Vata* being *Ruksha* (dry) and *Sheeta* (cold) in nature may cause stiffness of vessels which increases peripheral vascular resistance and leads to hypertension [35].

The third mechanism is due to defects in the vascular smooth muscles (atherosclerotic changes caused by factors like hyperlipidemia) where the blood vessels lose their normal tone and this increases peripheral resistance, thus causing hypertension [36]. This pathology may be due to the vitiating of *Kapha Dosha* and *Medo Dhathu*. Based on these points it can be deduced that the pathology of hypertension involves one or all the three *Doshas* which in turn affects the *Rasa* and *Rakta Dhatus* to cause this condition [Hypothetical *Samprapti* (pathogenesis) of hypertension is shown in Flow Chart 1].



**Flow Chart No. 1.** Hypothetical Samprapti flow chart of hypertension.

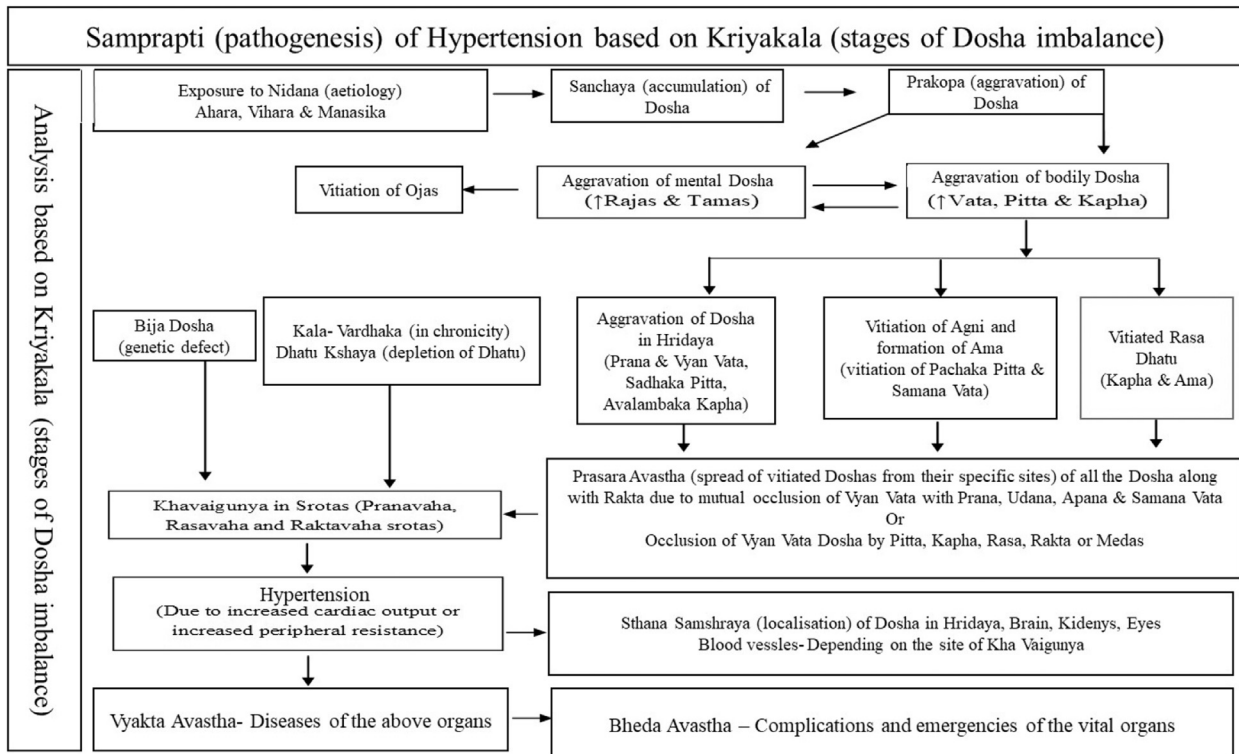
**7. Concept of Avarana in the pathogenesis of hypertension**

As blood circulation is mainly the function of *Vata* (*Vyana vata*) [9], its impairment is certain in Hypertension [37] It may be impaired by its own *Prakopa* (aggravation) due to *Vataja Nidanans* (etiological factors for *Vata*) or may get vitiated by the influence of other *Doshas* and *Dhathus*. This is where the concept to occlusion of normal functioning of *Vata* plays a major role in the pathogenesis of hypertension. The normal course of *Vata* can be occluded by *Pitta*, *Kapha*, *Rakta* and or *Medas* [Charaka Samhita, Chikitsa Sthana; 28/ 61–69]. These *Anyo-Dosha Avarana* pathologies can be considered under the hypertension due to increased hormonal and enzymal action [38], decreased sodium excretion [39], change in the chemical constituents in the blood and atherosclerotic changes in the arteries due to lipid deposition [40]. Another type of occlusive pathology happens when there is *Anyonya Avarana* of *Vata* (mutual occlusion between subtypes of *Vata*). The subtypes of *Vata* such as *Prana* and *Vyana Vata* obstruct each other and cause the disease [Charaka Samhita, Chikitsa Sthana, 28/200–215]. This condition can be considered as hypertension due to hampered autonomic nervous system as it plays an important role in the regulation of blood pressure [41,42,33]. *Charaka* and *Sushruta* have enumerated and explained many different types of mutual occlusions of *Dosha* and occlusion of one *Dosha* by other *Dosha* or *Dhatu* and in many of these conditions; symptoms of hypertension such as giddiness, headache, and fatigue have been mentioned. These conditions are: *Pittavritavata*, *Vyanavrita Prana*, *Pittavrita Prana*, *Pittavrita Vyana*, *Pittavrita Samana* and *Pittavrita Udana* [Charaka Samhita, Chikitsa Sthana, 28/221–230]. Other conditions where these symptoms are seen together are *Amashayagata Vata* [Sushruta Samhita, Nidana Sthana, 1/32–39]. *Rakta Dushti & Pradoshaja Vikara* [Charaka Samhita, Sutra Sthana, 24/5–10] and *Pittaja Hridroga* [Charaka Samhita, Sutra Sthana; 17/32]. *Vyana Vata* is said to be responsible for *Sweda* (sweat) and *Asruk Sravana* (ejection of

blood) and if it gets vitiated it produce diseases which will affect the entire body [Charaka Samhita, Sutra Sthana, 24/11–16]. This can be correlated to hypertension as excessive perspiration is a symptom of hypertension.

**8. Symptomatology of hypertension and Samprapti based on Kriyakala**

Mild to moderate hypertension in most cases does not exhibit any symptoms. But sudden or severe hypertension produces symptoms like headache, giddiness, palpitations, excessive sweating, fatigue, exertion dyspnoea and insomnia [43]. In *Ayurveda*, a disease should have specific *Lakshanas* (symptoms) to be called a *Vyadhi* [44], thus hypertension being asymptomatic (in its mild and moderate forms) is not described as a disease in *Ayurveda*. In the different stages of a disease, *Prasarvastha* is the stage where the *Doshas* move out from their respective sites and along with *Rakta* circulate all over the body, causing certain mild, nonspecific symptoms [Sushruta Samhita, Sutra Sthana, 21/28]. This in turn hampers the functions of the respective *Srotas* in the beginning and later they bring about structural changes as well, leading to *Kha-Vaigunya*. Then, these *Doshas* get lodged at susceptible sites of *Kha-Vaigunya* which in this case can be: heart, brain, kidneys, eyes and blood vessels. It is at this stage that the actual *Sthana Samshraya* (vitiated *Doshas* getting stuck in a particular site) and *Vyakta Avastha* (manifestation of specific symptoms) occur, causing diseases of these vital organs. Later, in the *Bheda avastha* (complicated stage), there occurs severe damage to these organs, making the disease *Asadhya* (incurable) and sometimes leading to death itself. Thus, hypertension can be taken as a sub-clinical condition where the disease process is still in progress making it a risk factor for more dangerous diseases of the heart, brain, kidneys, eyes etc. according to *Ayurveda* (probable pathogenesis of hypertension based on *Shad Kriyakala* is shown in [Flow Chart 2](#)).



**Flow Chart No. 2.** Samprapti (pathogenesis) of hypertension based on Kriyakala (stages of Dosha imbalance).

## 9. Principles of management

Ayurveda gives more emphasis to the prevention and promotion of the health. Avoiding etiological factors of disease is considered as the first line of management [Sushruta Samhita of Sushruta, Uttara Tantra, 1/25]. In the management of hypertension, non-pharmacological methods such as correction of lifestyle, diet etc. is proven to reduce the risk of Coronary heart disease (CHD) which is leading cause of morbidity and mortality worldwide [45]. The role of Ayurveda is more pertinent here, many of the chapters in classical texts such as *Dinacharya Adhyaya*, *Ritucharya Adhyaya*, *Matrashiteeya*, *Navegannadharniya Adhyaya* etc. are particularly dedicated to healthy lifestyle. These include the harmonious living pattern by a deeper understanding of human life and its interaction with nature. Adopting Ayurveda guidelines may be helpful to reduce the increasing incidence and management of lifestyle disorders which include hypertension [46,47]. This will also reduce the risks which are associated with the drug therapy. Long-term drug treatment can be expensive and side-effects can threaten patients' adherence to the medicines [48]. In general, reducing body weight, stopping smoking, healthy diet and increasing physical exercise are routinely recommended by most of the physicians [49]. While treating this condition *Prasara Avastha* of all the *Tridosha* and *Rasa, Rakta and Meda Dushti* should be taken in to consideration and along with lifestyle modifications, appropriate *Vata Anulomana* (maintaining normal course of *Vata*) *Tridoshahara* (normalizing all *Tridosha*), and *Rasa, Rakta Prasadakar* (blood purifying), *Medohara* (reducing excess fat) *Chikitsa* may be adopted.

## 10. Conclusion

Improper life-style and food habits, psychological stress factors like *Atichinta* (excess worry), *Bhaya* (fear), *Krodha* (anger), *Alasya* (dullness) etc., with or without genetic predisposition provokes and vitiates all the three *Doshas* to trigger the pathogenesis of hypertension. *Anya Dosha Avarana* and *Anyonya Avarana* are the mechanisms of pathogenesis. Though modern science considers hypertension as a disease, from the *Ayurveda* point of view it should be understood as the *Prasaravastha* of all the *Doshas* along with *Rakta* which circulate all over the body until they get lodged at a site of *Kha-Vaigunya*. This decides the organ of impact of the disease process (whether brain, heart, kidneys, eyes or blood vessels). With the help of recent advancements in the medical science the, diagnosis of this condition has been made possible at an early stage and thus effective management can be offered at this stage itself to avoid risk of damage to vital organs. Thus, hypertension can be understood as a psycho-somatic hemodynamic condition where *Vata Pradhana Tridoshas* are vitiating affecting the *Rasa-Rakta Dhatu* as *Dooshyas* with both *Sarva Shareera* (whole body) and *Manas* (mind) as its *Adhithana* (site). For effective management of hypertension, lifestyle modifications should be given more emphasis and if necessary appropriate drug therapy should also be given.

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None.

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