

(RESEARCH ARTICLE)



## Cross sectional survey to assess the effectiveness of HT KOT among the Ayurveda medical practitioners across India

Anoop A K \*, Ramesh.P. R, K. P. Nair, P. Venugopalan and T. Jayaraj

*Clinical research, Arya Vaidya Sala Kottakkal, India.*

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### Abstract

Hypertension (High blood pressure) is ranked as the third most important risk factor for attributable burden of disease in south Asia. Hypertension (HTN) exerts a substantial public health burden on cardiovascular health status and healthcare systems in India. Overall prevalence for hypertension in India is 29.8% (95% confidence interval: 26.7–33.0). Significant differences in hypertension prevalence were noted between rural and urban parts of the population. [27.6% (23.2–32.0) and 33.8% (29.7–37.8);  $P = 0.05$ ] It is estimated that at least one in four adults in India has hypertension, but, only about 12% of them have their blood pressure under control. India has set a target of 25% relative reduction in the prevalence of hypertension (raised blood pressure) by 2025.

HT Kot tablet is used in the treatment and management of hypertension. HT Kot contain 3 ingredients namely Jadamamsi (*Nardostachys jatamansi*), Sarpagandha (*Raufofia serpentine*) and Ruraksha (*Elaeocarpus sphaericus*). It is observed that HT kot helps in improving the cardiovascular functions. It is also observed that HT Kot helps to reduce nervousness and anxiety. A descriptive cross sectional survey was done among Ayurvedic physicians in different parts of India. Out of 128 physicians, 86 (67.18%) physicians having more than 10 years of experiences.

Survey reveals that majority of the physicians (more than 75%) opined that HT kot is effective in stage 1&2 hypertension. The added effect of HT Kot is that it helps to improve the quality of sleep, reduce hyperactivity in children and anxiety. Majority of the respondents opined that the ideal time of administration of HT kot is after breakfast and dinner. The combination therapy with HT Kot is good in many conditions like hyperactivity, nervousness, hyperacidity and fatigue. The present article is based on the survey conducted among the Ayurvedic practitioners in different parts of India, to assess the effectiveness and additional benefits observed with HT kot.

**Keywords:** HT Kot; Vyana vayu; Jadamamsi; Sarpagandha; Hypertension

### 1 Introduction

Hypertension is the most common of all the cardiovascular diseases and affects many people in developed as well as developing countries. It is recognized as an important public health problem connected with life style all over the world. It is often asymptomatic and can lead to lethal complications if left untreated.<sup>1</sup>

Blood pressure is a commonly observed health issue in various populations. The epidemiological studies have demonstrated that hypertension is potentially harmful in the young as in the old and it is an important risk factor for most of the cardiovascular complications like congestive cardiac failure, stroke, myocardial infarction and sudden death.

\* Corresponding author: Anoop A K

### 1.1 Classification on the basis of level of blood pressure:

Normal: Systolic Blood pressure (SBP) less than 120 and Diastolic Blood pressure (DBP) less than 80mmHg;

Elevated: SBP 120 to 129 and DBP less than 80mmHg;

Stage 1 hypertension: SBP 130 to 139 or DBP 80 to 89mmHg;

Stage 2 hypertension: SBP greater than or equal to 140 mmHg or greater than or equal to 90 mmHg.<sup>2</sup>

The knowledge about the concept's regarding hypertension is helpful for the clinician to identify those individuals at high risk who need to undergo evaluation and treatment. It further helps in selecting ideal treatment strategies for hypertensive patients with co morbid conditions.

### 1.2 Ayurvedic concept of Hypertension

Detailed description of the physiology of blood pressure is not found in Ayurveda literature but the concept of circulation of Rasa-Rakta inside the body with the help of Vyāna vāyu has been described in ancient text by Acharya<sup>3</sup>. Forceful contraction and expansion of the heart with the help of Vyāna vāyu, is responsible for the effective whole body circulation of rasa and rakta and hence the vyana vāyu functions are considered to be the vital force for the circulatory system according to Ayurveda. So, it recognize the involvement of vyāna vāyu in regulation of blood pressure<sup>1</sup>.

HT Kot tablet is used in the treatment and management of hypertension. HT kot is prepared by Arya vaidyasla Kottakkal, Kerala. HT Kot contain 3 ingredients namely *Jadamamsi (Nardostachys jatamamsi)*, *Sarpagandha (Raufofia serpentine)* and *Ruraksha (Elaeocarpus sphaericus)*. It is observed that HT kot helps in improving the cardiovascular functions. It is also observed that HT Kot helps to reduce nervousness and anxiety. For assessing the effectiveness and added benefits, a cross sectional survey was done among 128 Ayurvedic practioners who are using HT kot in their practice on a regular basis. The article has been organized indifferent sections as follows

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## 2 Material and methods

### 2.1 Objective

To assess the effectiveness and added benefits of HT Kot in the management of Hypertension.

### 2.2 Methodology

Review of Literature: Compilation of references on *HT KOT and Hypertension* from *Ayurvedic classics and journals*.

### 2.3 Materials

#### 2.3.1 Primary resources

Bruhat trayi, laghu trayi with available commentaries, Classical text like Baishjyarnavali

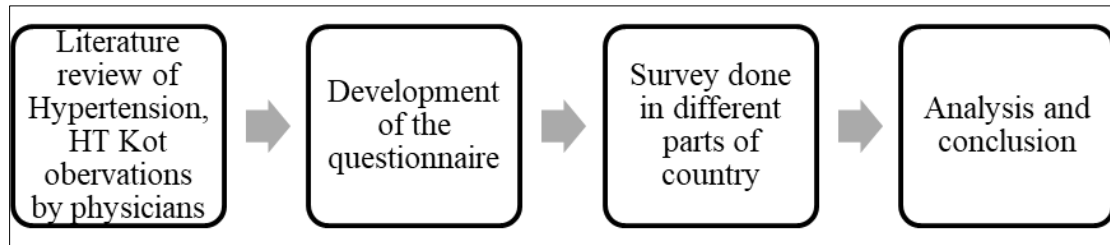
#### 2.3.2 Secondary resources

Relevant modern literature, previous research works, MD and PhD theses, journals, articles, published research papers and subject related data available online.

Developed questionnaire- Done face validity- Initially a questionnaire was developed and took expert suggestions. More than 80% of the contents were agreed by the experts like clinicians with more than 25 years of experience.

### 2.4 Methods

Primary and secondary resources were reviewed in the light of hypothesis and plan of study and necessary materials were compiled. Compiled materials were thoroughly studied, re-arranged and critically analysed to provide the logical base for survey study.



**Figure 1** Plan of the study

## 2.5 Conduct of survey

### 2.5.1 Study design

Descriptive Cross sectional study

### 2.5.2 Study population

In the present study, physicians practicing Ayurveda in different parts of India.

### 2.5.3 Inclusion criteria

Age group: 20 – 80 years

Sex: Both sex included

### 2.5.4 Exclusion criteria

Persons who are not willing to participate.

### 2.5.5 Sample size

It was calculated by using the following formula:

$$n = \frac{Z_{1-\alpha/2}^2 \overset{\text{Expected Proportion}}{p(1-p)}}{\underset{\text{Absolute Error}}{d^2}}$$

$$\begin{aligned} Z_{1-\alpha/2} &= 1.96 \\ P &= 50 \% \\ d &= 10 \% \end{aligned}$$

Expecting 50% prevalence of effectiveness of HT Kot and considering a 10% margin of precision, the sample size is calculated as 110. Considering a drop out of 10%, the total sample size is considered as 100. Survey was conducted by sending request form and brief introduction about the study were sent to the selected participants along with the google form.

## 2.6 Data collection

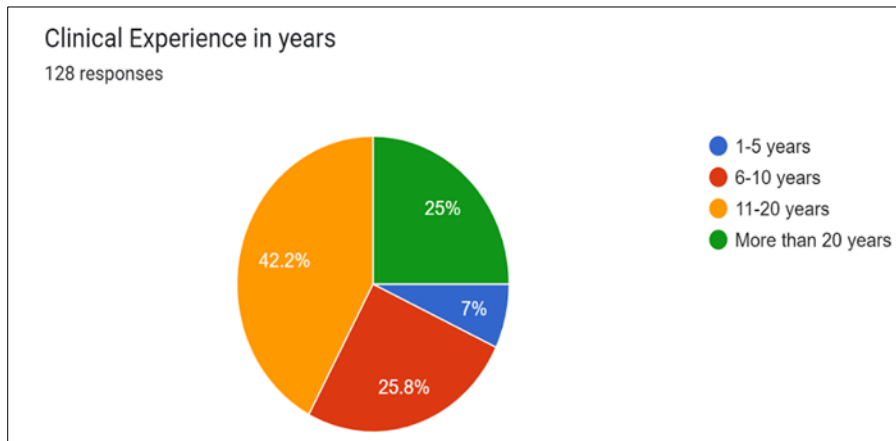
Primary collection of data with a structured questionnaire though Google form

## 2.7 Statistical analysis

Cross sectional study- Prevalence will be published in terms of frequency and percentage

Sub analysis- Crosstabs, Chi-square test

### 3 Results



**Figure 2** Clinical Experience of Ayurveda physicians

**Table 1** Clinical experiences of Ayurveda physicians

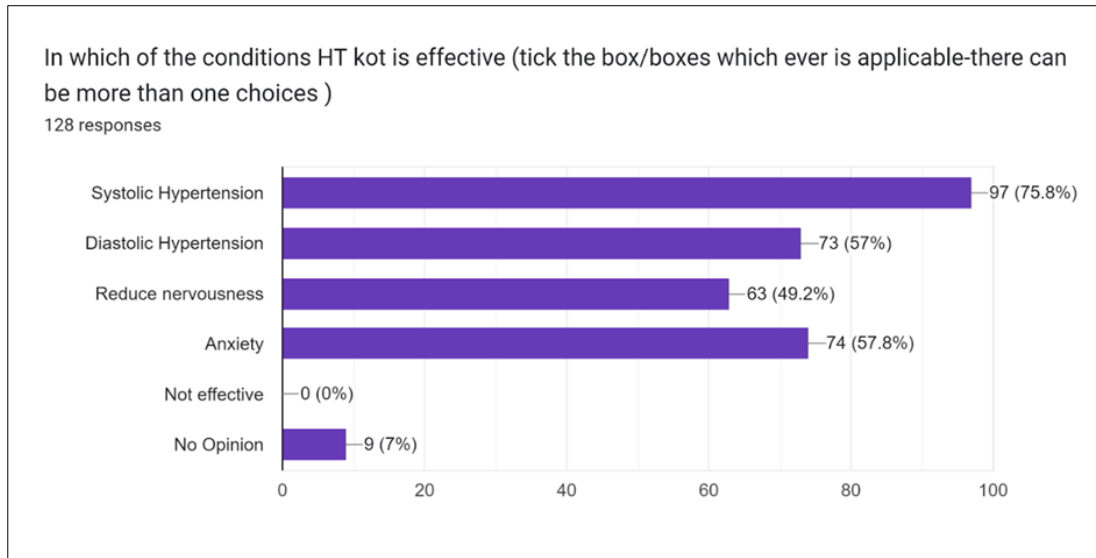
		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	1-5 years	10	7.0	7.8	7.8
	6-10 years	33	25.8	25.6	33.3
	11-20 years	54	42.2	41.9	75.2
	More than 20 years	32	25.5	24.8	100.0
	Total	128	90.8	100.0	
Missing	System	0	9.2		
Total		128	100.0		

Out of 128 responses, 54(42.2%) physicians having 11-20 years of experiences. 32(25%) having more than 20 years. 33(25.8%) physicians having 6-10 years of experiences. Out of 128 physicians, 86 (67.18%) physicians having more than 10 years of experiences.

**Table 2** Crosstabulation-Clinical experiences and Effectiveness of HT Kot

		Effectiveness of HT Kot			Total	
		Not Effective	Mild action	Moderate action	Very Effective	
Clinical experiences	1-5 years	0	0	7	3	10
	6-10 years	0	2	13	18	33
	11-20 years	2	3	18	31	54
	More than 20 years	0	1	10	21	32
Total		2	6	48	73	129

The cross tab shows that the effectiveness of HT kot and the clinical experience as follows. Out of 128 responses, 121(73+48) physicians responded Ht kot is very effective and moderate effective in its indications. 73 of physicians having more than 20 years of experience suggested that HT kot is very effective in the management of hypertension and other indications. 48 Practioners with 11-20 years of experience opined that it got moderate action.



**Figure 3** Indications of HT Kot

**Table 3** Indications of HT Kot

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Systolic Blood pressure	97	75.8	76.7	76.7
	Diastolic B P	73	57	23.3	100.0
	Reduced nervousness	63	49.2	100.0	
	Reduced Anxiety	74	57.8		
Total		128	100.0		

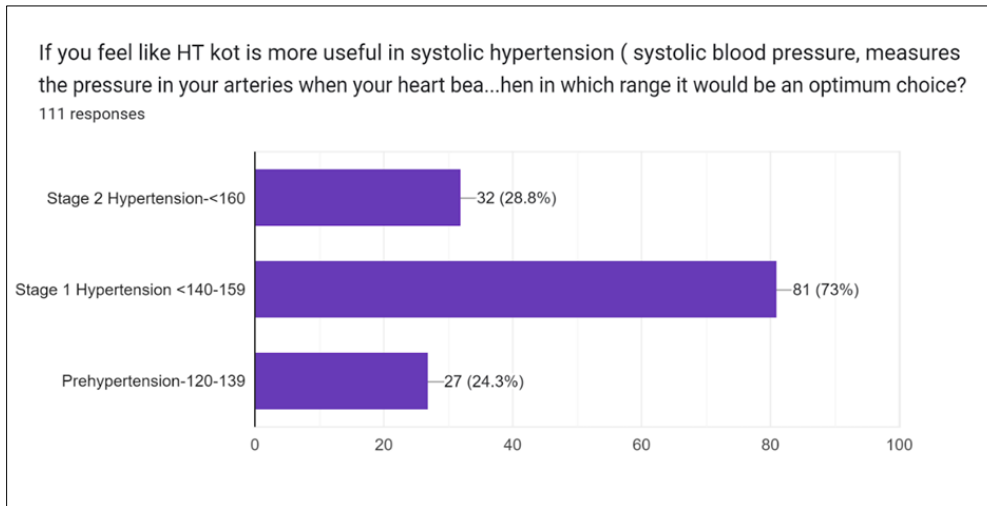
Among 128 responses more than 66% of Ayurvedic practioners opined that HT kot is effective in both types of hypertension. More than 60% participants responded that it is good in anxiety and reduce nervousness.

**Table 4** Cross tabulation -Indication of HT kot and Effectiveness of HT Kot

		Effectiveness of HT Kot				Total
		Not Effective	Mild action	Moderate action	Very Effective	
Indications	Systolic BP	2	5	38	54	128
	Diastolic BP & Anxiety	1	2	31	38	
Reduce Nervousness		1	2	26	34	

The cross tab shows the effectiveness of HT kot in various conditions. Out of 128 responses, 126 physicians having experience in treating the afore mentioned 4 conditions opined that it is very effective in all of these conditions.

### 3.1 Stage of systolic Blood pressure



**Figure 4** Stages of Systolic Blood pressure

**Table 5** Types of systolic Blood pressure

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Prehypertension	27	24.3	34.1	11.8
	stage 1Hypertension	81	73	65.9	56.9
	stage 2 Hypertension	57	41.2	45	65.7
	Total	128	97.1	100.0	
Missing	System	3	2.9		
Total		128	100.0		

Out of 128 respondents, (73 %) have reported that HT kot is more effective in Stage 1 Hypertension, 47 (37 %) have reported that HT Kot is effective in the management of Systolic blood pressure in all three stages.(Pre,stage1 and stage2)

**Table 6** Cross tabulation Clinical experiences and Stages of Systolic Blood pressure

		Cross tabulation			
		Stages of Systolic BP			Total
		Stage 1 HTN	Stage 2 HTN	Prehypertension	
Clinical experiences	1-5 years	6	5	4	15
	6-10 years	22	12	11	45
	11-20 years	39	29	14	82
	More than 20 years	17	11	15	43
Total		84	57	44	

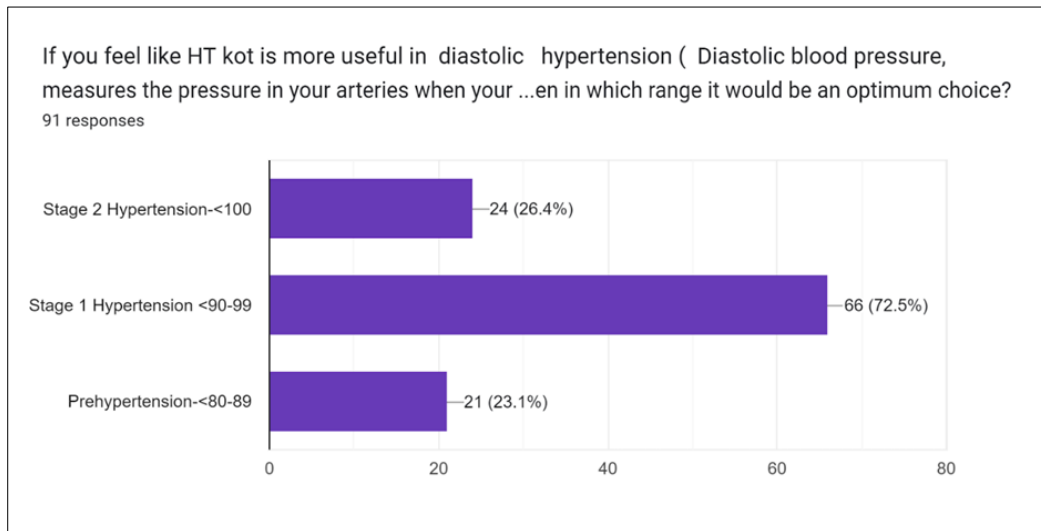
Cross tab shows experienced practioners opined that HT kot is useful in three stages of systolic blood pressure.

**Table 7** Chi-Square Test

	Value	df	Asymp. Sig. (2-sided)
Pearson Chi-Square	11.126	1	0.001
Continuity Correction <sup>b</sup>	9.875	1	0.002
Likelihood Ratio	11.205	1	0.001
Fisher's Exact Test			
Linear-by-Linear Association	11.039	1	0.001
N of Valid Cases	128		

The test for association of stages of systolic blood pressure and ideal time of taking HT Kot (After food) got significant association with a P value 0.001(which is less than 0.05).

### 3.2 Stage of Diastolic Blood pressure



**Figure 5** Stage of Diastolic Blood pressure

**Table 8** Type of Diastolic Blood Pressure

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Prehypertension	64	45.8	50.4	9.8
	Stage 1HTN	90	63.4	69.8	52.0
	Stage 2 HTN	63	44.4	48.4	64.7
	Total	128	97.1	100.0	
Total		128	100.0		

Out of 128 respondents, 90 (63.4 %) have reported that HT kot is more effective in Stage 1 Diastolic blood pressure, 72 (56.5 %) have reported that it is a drug of choice in three stages of Hypertension.

**Table 9** Cross tabulation - Clinical experiences and Diastolic Blood pressure

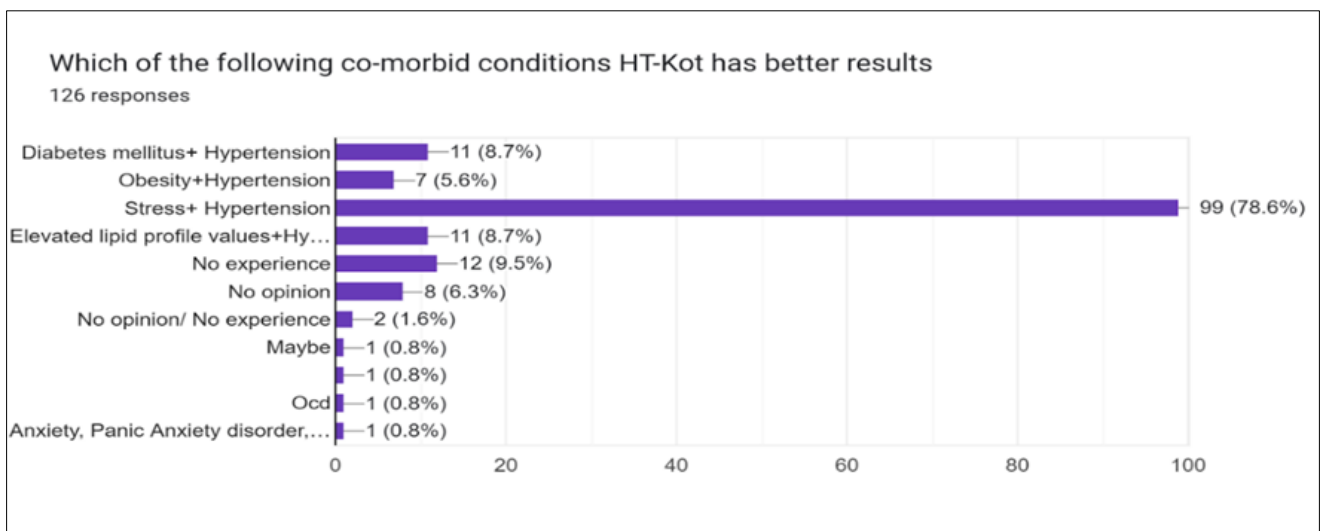
		Cross tabulation			
		Stages of Diastolic BP			Total
		Stage 1 HTN	Stage 2 HTN	Prehypertension	
Clinical experiences	1-5 years	9	5	4	18
	6-10 years	18	13	20	51
	11-20 years	37	31	21	89
	More than 20 years	25	13	18	66
Total		89	62	63	202

Cross tab shows experienced practioners opined that HT kot is useful in three stages of diastolic blood pressure.

**Table 10** Chi-Square Tests

	Value	df	Asymp. Sig. (2-sided)	Exact Sig. (2-sided)	Exact Sig. (1-sided)
Pearson Chi-Square	7.463	1	0.006		
Continuity Correction <sup>b</sup>	6.450	1	0.011		
Likelihood Ratio	7.560	1	0.006		
Fisher's Exact Test				0.007	0.005
Linear-by-Linear Association	7.405	1	0.007		
N of Valid Cases	128				

The test for association of stages of diastolic blood pressure and ideal time of taking HT Kot(After food) got significant association with a P value 0.006(<0.05).



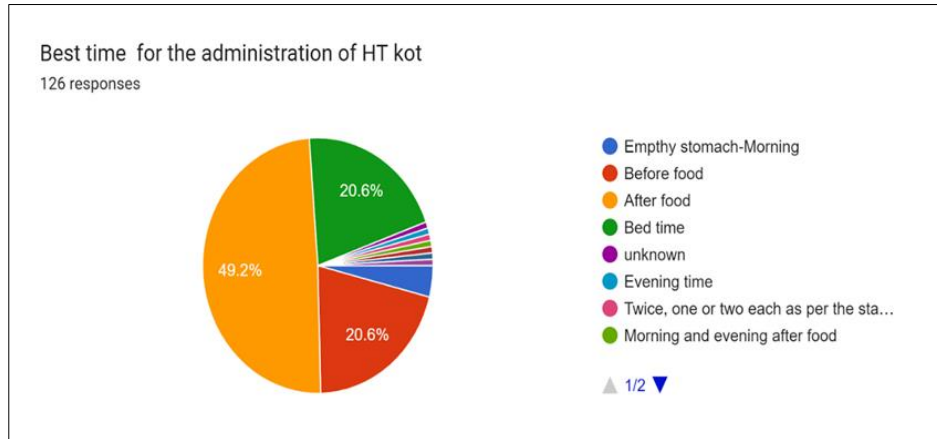
**Figure 6** Co-morbid conditions and Effect of HT Kot



**Table 11** Stress +Hypertension

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	No Opinion about stress+ Hypertension	28	21.4	21.7	21.7
	Stress+Hypertension	99	78.6	78.3	100.0
	Total	128	100	100.0	
Total		128	100.0		

Majority of the doctors opined that HT Kot is more effective in stress and hypertension 99(78.6%).



**Figure 7** Ideal time of administration of HT Kot

Majority doctors (64) opined that ideal time of administration of HT Kot is after breakfast and dinner (49.2%). 26(20.6%) Physicians opined that the ideal time of taking HT Kot is before food and at bed time.

**Table 13** Chi-Square Test

	Value	df	Asymp. Sig. (2-sided)
Pearson Chi-Square	10.262	3	0.016
Likelihood Ratio	10.368	3	0.016
Linear-by-Linear Association	9.562	1	0.002
N of Valid Cases	128		

The test for association of effectiveness of HT Kot and ideal time(After food) for consuming HT Kot is found to be statically significant with P value 0.016(<0.05).

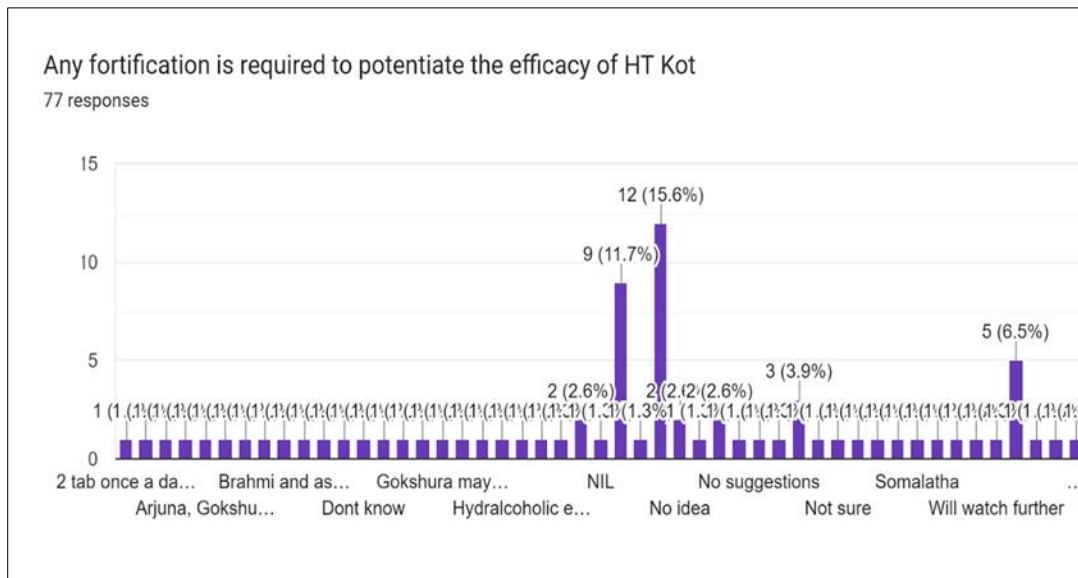
**Table 14** Case Processing Summary

	Cases					
	Valid		Missing		Total	
	N	Percent	N	Percent	N	Percent
After food and Effectiveness of HT Kot	128	90.8%	2	9.2%	128	100.0%

**Table 15** Cross tabulation- After food and Effectiveness of HT Kot

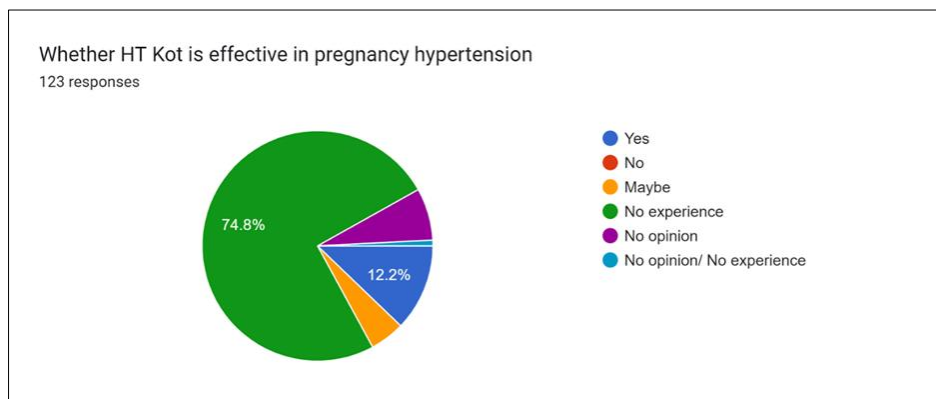
Count		Effectiveness of HT Kot				Total
		Not Effective	Mild action	Moderate action	Very Effective	
Afterfood	No opinion about Afterfood	2	3	18	16	39
	After food	0	2	30	57	89
Total		2	5	48	73	128

Majority of Ayurvedic physicians (89) opined that HT Kot is very effective (57) and moderate effective (30), when it is taken after food.



**Figure 8** Fortification of HT Kot with other medicine

Most of the participants suggested that goroChanadi gulika is an effective combination with HT Kot in the management of Hypertension. Drakshadi kwatham is another combination suggested in the management of stress and anxiety along with HT kot.



**Figure 9** Effectiveness of HT Kot in pregnancy Hypertension

74.8% of the practitioners are not having experience of using HT Kot in pregnancy hypertension. 12.2% of the physicians suggested it is good in pregnancy hypertension.

**Table 16** Cross tabulation Clinical experiences and Pregnancy Hypertension

Count		Pregnancy hypertension		Total
		No experience in pregnancy HTN	Effective in pregnancy hypertension	
Clinical experiences	1-5 years	8	2	10
	6-10 years	29	4	33
	11-20 years	40	13	53
	More than 20 years	28	4	32
Total		105	23	128

The physicians with more than 10 years of experience (17) opined that it can be given in pregnancy hypertension.

**Table 17** Major Symptoms got relieved by the use of HT Kot

SL NO	Symptoms	Frequency	Percentage	Combination medicine
1	Anxiety	56	54.6%	Drakshadi kwatham
2.	Headache	44	42.3%	Migrakot
3.	Confusion	11	10%	Manasasamitram vatakam
4.	Fatigue	16	15.6%	Aswagandha tablet
5.	Improves sleep	30	29%	Sole use of HT Kot
6.	Irregular heart rhythm and Increased blood pressure	11	10%	GoroChanadi gulika

**Table 18** HT kot- Any other additional observations about its action in your practice (For product validation)

Sl no	Additional Observations
1.	Improves sleep
2.	Reduces Hyperactivity, restlessness
3.	Reduces Depression
4.	Conditions of hyperacidity, cervical radiculopathy are also managed by some physician

#### 4 Discussion

Hypertension is the most common of all the cardiovascular diseases and affects many people in developed as well as developing countries. Hypertension is a psychosomatic condition which have direct connection with autonomic nervous system<sup>4</sup>. Stress of daily life, emotions like fear and anger also are contributing factors adds to the cause. Modern busy life style plays an important role in the etiopathogenesis of Hypertension.

Ayurveda does not mention about a single disease entity like hypertension but it can be perceived and can be managed on the basis of dosha-dushya vivechanā. The contraction and expansion of the heart with the help of Vyāna vāyu, is

responsible for the effective whole body circulation of rasa and rakta and hence the vyana vayu functions are considered to be the vital force for the circulatory system according to Ayurveda. The involvement of vyāna vāyu on regulation of blood pressure is well recognized. Ht kot contain *jadamamsi*, *sarpagandha* and *rudraksha* and its properties are given in the following table 20

**Table 19** Properties of ingredients of HT Kot.

Sl no	Ingredients of HT Kot	Rasa	Guna	Veerya	Vipaka	Doshakarma
1	<i>Jadamamsi</i>	<i>Tikta</i> (Bitter) <i>Kashaya</i> (Astringent), <i>Madhura</i> (Sweet)	<i>Laghu</i> (Light) <i>snigdha</i> (unctuous) <i>tikshna</i> (sharp)	<i>Seetha</i> (cold)	<i>Katu</i> (pungent)	Tridosahara
2.	<i>Sarpagandha</i>	<i>Tikta</i> (Bitter)	<i>Ruksha</i> (Dry quality)	<i>Ushana</i> (Hot)	<i>Katu</i>	Vata-kapha hara
3.	<i>Rudraksha</i>	<i>Madhura</i>	<i>Guru</i> (Heavy), <i>snigdha</i>	<i>seetha</i>	<i>madhura</i>	Vata-pitta hara

According to the table all the ingredients of HT Kot have vatahara property and we have already discussed the importance of vyana vayu in the context of the control hypertension.

Sādhaka pitta which situated in heart relates to the mental function<sup>5</sup>. Cakrapāni explains that Shaurya, bhaya, krodha, harsha, moha are emotions connected with heart which has a direct impact on blood pressure. Thus, sādha pitta plays an important role in normal physiology of blood pressure. The major ingredient of HT Kot is *jadamamsi*. In various studies it has shown the tendency to affect the functioning of the Manovaha Srotas<sup>6</sup> and as per this survey HT kot has shown to have a marked effect on anxiety and allied problems. Most of the respondents have opined that the combination of Drakshadi kwatham with HT kot has a considerable effect in Mano vaha sroto rogas as they act as pitta vata samana.

This survey also reveals that HT kot is useful in improving the stress related Hypertension and which we have discussed already. Another study on *jadamamsi* have revealed the antioxidant property of *Jadamamsi* both in vitro and in vivo experiments. It reduces the stress induced biochemical changes in brain as well as in stomach. Antioxidant and anti-stress property of *jadamamsi* is explained on the basis of the changes taking place in the properties of flavonoids and polyphenols.<sup>7</sup>

The ideal time for consuming HT kot has been observed as after food intake and this actually agrees with the classical idea of Beshaja kala of Vyana Vata ,which is explained as anna anthoum(ie after food intake)<sup>8</sup>.

As explained earlier, hypertension is mainly considered to be a psychosomatic disorder. The Manāsa Bhavas play a vital role in the process of Jatharagnimandya which leads to Rasapradoshaja Vikāra. Over thinking and stress (*Chintyanama ca atichintyanat*).<sup>9</sup>is an important cause considered here for rasa dusti.

The above survey indicates that the ingredients of Ht KOT tablet have an effect on both sareerika(body) and manasika (mental) doshas. It is concluded that HT Kot tablet can be used effectively in the long term management of hypertension and in the associated conditions like anxiety, restlessness like manovahasrotovikaras. It is also observed that it helps in improving the quality of sleep.

## 5 Conclusion

Out of 128 physicians, 86 (67.18%) physicians having more than 10 years of experiences.

- HT Kot is very effective in the management of systolic and diastolic blood pressure.(stage1&2)
- It plays an important role in the management of nervousness and anxiety.
- Some additional benefits observed by using HT kot are improvement in the quality of sleep, reduction of stress related hypertension, control of hyperactivity in children etc.
- In various health conditions like anxiety, fatigue etc the combination therapy of HT kot can give positive results

- The ideal time for consuming HT kot is observed to be 'after food' (dosage can be fixed according to severity of the condition)
- Statistically significant values (P value <0.05) obtained in the survey
  - Stages of systolic blood pressure and ideal time of taking HT Kot(After food)
  - Stages of diastolic blood pressure and ideal time of taking HT Kot(After food)
  - Effectiveness of HT Kot and ideal time (After food) of consuming HT Kot.

#### *Future work recommendation*

A comparative clinical trial for assessing the effectiveness, added benefits of HT kot with the commonly using hypertensive medicine may done.

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### **Compliance with ethical standards**

#### *Acknowledgments*

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#### *Disclosure of conflict of interest*

All authors read, provided feedback and approved the final manuscript. The authors have no conflict of interest to declare.

#### *Statement of ethical approval*

The present research work does not contain any studies performed on animals/humans subjects by any of the authors.

#### *Statement of informed consent*

Informed consent was obtained from all individual participants included in the study.

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