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Determination of the association between excessive intake of *Rasa* and Retinal vascular changes in Pregnancy-Induced Hypertension- A Pilot Study

Research Article

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Abstract

Background: Pregnancy-induced hypertension (PIH) is a hypertensive disorder in pregnancy that occurs in the absence of other causes of elevated blood pressure. There are many complications documented for PIH and associated retinal vascular changes in one of them. During pregnancy if proper antenatal care along with diet is not followed, patient may land into complications like PIH related retinopathy. Aim: To determine the retinal changes in pregnancy induced hypertension (PIH) and any association between the retinal changes and excess intake of specific *Rasa*. Methods: All the patients admitted in ward with diagnosis of PIH were included in this study. Age, race, gravida, gestation period, blood pressure, and proteinuria along with dietary habit were noted from the case records. After taking history for any eye symptoms, fundus examination was done after dilating the pupils with direct ophthalmoscope in the ward itself. All the findings were noted on a data sheet, and were analyzed. Results: A total of 24 patients of PIH were examined. Majority were urban (75%) and remaining are from rural area (25%). The majority of patients are from 24-28 years age group followed by below 20 years age group. The gestation period ranged from 20 weeks to 38 weeks; 16 (66.6%) were primi gravida. Nineteen (79.1%) patients had mild preeclampsia, 03 (12.5%) had severe preeclampsia and 2 (8.33%) had eclampsia. Retinal changes (hypertensive retinopathy) were not seen in any of these patients Haemorrhages or exudates or retinal detachment were not seen in any patient. There was no association of retinal changes and *Rasa Sevan* a found in present pilot study. Conclusion: Retinal changes were not seen in any of the patients with PIH in present study sample and there was not found to be associated with excess intake of specific *Rasa* and severity of the disease. Fundus examination is necessary in assessment of the PIH patient.

Key Words: Pregnancy Induced Hypertension, *Rasa Sevan,* Hypertensive retinopathy, *Amla Rasa.*

Introduction

Pregnancy induced hypertension (PIH) is a hypertensive disorder in pregnancy that occurs in the absence of other causes of elevated blood pressure (140/90mmHg, or a rise of 30mmHg of systolic pressure, or a rise of 15mmHg of diastolic pressure), taken on two occasions after rest, in combination with generalized edema and/or proteinuria. Pre-eclampsia is caused by significant proteinuria. In eclampsia, patient is having seizures or coma as a complication of PIH. (1)

Vascular endothelial dysfunction leading to capillary leak and generalized vasospasm are the pathological changes leading to the retinal vascular changes in PIH. These retinal vascular changes may or may not be associated with severity of systemic hypertension. After delivery, the vasospastic changes are reversible and the retinal vessels gain its normalcy.

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Rasa is termed as taste in English. *Rasa* is a broad term and having a larger concept than taste. The definition of a *Rasa* is "knowledge perceived through *Rasana Indriya* (~roughly gustatory sensation) which is located at *Jihva* (tongue)." Ayurveda has stated the six *Rasa* as *Madhur, Amla, Lavana, Katu, Tikta* and *Kashaya.*(2) These six *Rasa* are very essential for the development of body and hence Ayurveda explained the concept of *Shad-Rasatmaka Ahar* (~diet including six taste) by which a person can get the nourishment and benefits of consumption of these *Rasa* in daily diet if taken in proportion. (3) If these *Rasa* are consumed in excess then each excess *Rasa* develops imbalance of the body humour i.e. *Tridosha* and leads to diseases. *Rasa* can be recognized as a sensory knowledge through the tongue but excess intake may lead to diseased condition. (4)

There are some studies published that the retinal changes in PIH has association between blood pressure, proteinuria and severity of disease. (5) But according to Ayurveda, *Rakta* and *Pitta* have *Ashrayashrayi Bhava* and the vitiated *Pitta* leads to diseases of *Rakta* and in turn causes Sira Dushti which can be manifested as vascular changes. Excessive intake of *Amla*, *Lavana* and *Katu Rasa* can vitiate *Pitta* and ultimately *Rakta* which may lead to vascular changes in the body. These

Rasa are termed as *Achakshushya* (harmful to eyes). So the present study is a sincere effort to see whether during *Garbhini Paricharya* (Antenatal Care) if a pregnant woman having the PIH consume any of the *Achakshyushya Rasa* in excess and develops retinal vascular changes leading to hypertensive retinopathy.

Materials and methods

The present study is an observational study conducted in five month time span. The patients fulfilling the diagnostic criteria of PIH (>24 weeks of pregnancy, high arterial blood pressure and proteinuria) admitted in the obstetrics ward were included in this study.

The patients having pre-existing diseases like Diabetes, hypertension, renal diseases or other retinal diseases, hazy media in which ophthalmoscopy examination is not possible were excluded from the study.

A thorough history taking was done of each patient to rule out any other eye disease and systemic disease. Examination of anterior segment was done with a torch light on the bed itself. Visual Acuity was taken with portable Snellen's chart. Dilatation of both eyes was done with 1% Tropicamide eye drop and retina was examined with direct as well as indirect ophthalmoscope in semi dark room. Hypertensive retinopathy changes seen in right or left or both eyes, was taken as positive findings in that patient. Age, race, para, gravida, blood pressure, proteinuria were noted from the case records. The PIH was graded as pre-eclampsia (mild and severe) and eclampsia. All the findings were noted on a data sheet.

The gradations of the hypertensive retinopathy as per Keith Wagener classification are:

- Grade I – mild generalized arterial attenuation, particularly of small branches;
- Grade II – more severe grade I + focal arteriolar attenuation;
- Grade III – grade II + hemorrhages, hard exudates, cotton wool spots;
- Grade IV – grade III = optic disc swelling (papilledema)

The Classification of PIH as per severity is divided into preeclampsia and eclampsia

- Mild preeclampsia --- BP >140/90mmHg, proteinuria +, and/or mild edema of legs;
- Severe preeclampsia --- BP >160/110mmHg, proteinuria ++ or +++, headache, cerebral or visual disturbances, epigastric pain, impaired liver function tests, and increased serum creatinine; Eclampsia --- severe preeclampsia + convulsions. Proteinuria was tested using dipstix method and was graded as + = 0.3gm/L, ++ = 1gm/L, and +++ = 3gm/L.

The results were analyzed using statistical analysis. Chi-square test was used to determine the association between the retinal changes and blood pressure, and *Rasa Sevan* in PIH patient. A *P* value < 0.05 was taken as significant.

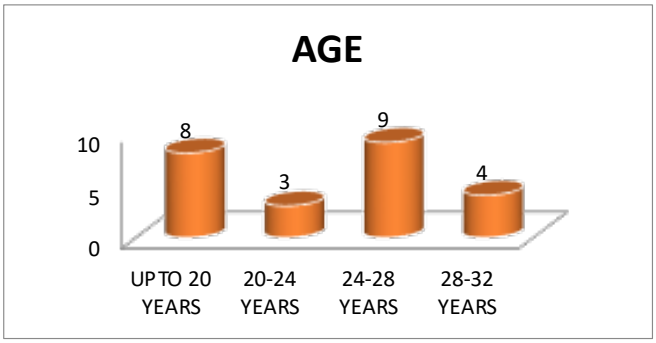
Observations and Results

A total of 24 patients were examined; out of 24 patients, 8 (33.3%) belongs to age group upto 20 years, 3 (12.5%) belongs to age group 20-24 years, 9 (37.5%) belongs to age group 24-28 years and 4 (16.7%) patients belongs to age group 28-32 years[Table.1 and Fig.1]. The mean age of patients was 30.2±6.2 years (range 20-32 years). The gestation period ranged between 20 and 41 weeks. Fourteen were (58.3%) primi gravida (first time pregnant), 8 (33.3%) were multi gravida (2-4 pregnancies) and 02 (8.3%) were grand multis (5 or more pregnancies). 10(41.67%) had mild pre-eclampsia, 12(50%) had severe pre-eclampsia and 2 (8.3%) had eclampsia.

Table.1. Age wise distribution of patients

Age	Frequency	Percentage
Upto 20 Years	8	33.3
20-24 Years	3	12.5
24-28 Years	9	37.5
28-32 Years	4	16.7
Total	24	100.0

Fig.1. Age wise distribution of patients (n=24)

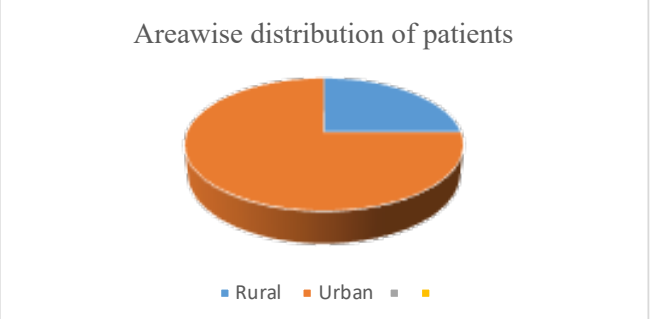


The urban patients found in the study are 18 (75%) while rural are 06 (25%). The probable reason may be the lifestyle associated changes leads to PIH during gestational age. The distribution shown in Table 2 and figure 2.

Table.2- Area wise distribution of patients

Area	Distribution (n=24)
Rural	06 (25%)
Urban	18 (75%)

Fig.2- Area wise distribution of patients (n=24)

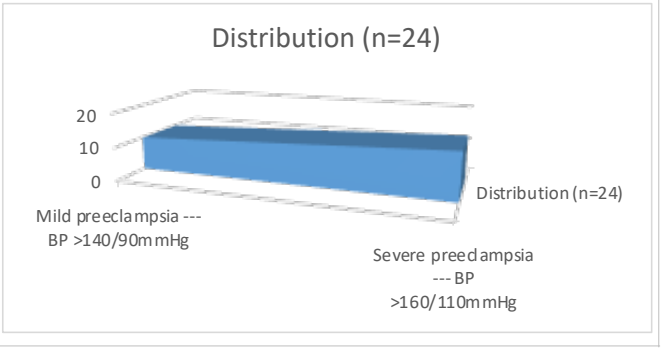


The distribution of patient according to disease severity, mild preeclampsia patient found in the study are 10 (41.67%) while severe pre-eclampsia are 14 (58.33%).The distribution shown in Table 3 and figure 3.

Table 3: Distribution of patient according to disease severity

Disease severity	Distribution (n=24)
Mild pre-eclampsia BP >140/90mmHg	10 (41.67%)
Severe pre-eclampsia BP >160/110mmHg	14 (58.33%)

Figure 3: Distribution of patient according to disease severity

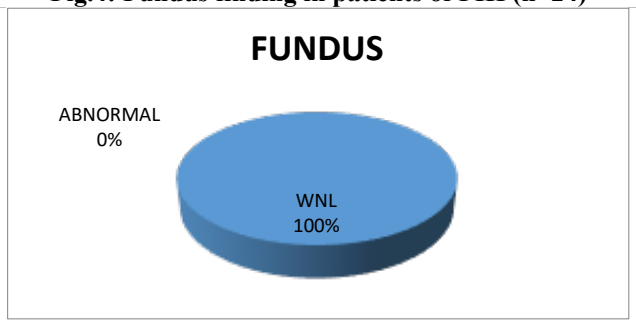


Blurriness of vision was present in 03 patient of severe preeclampsia with visual acuity was 6/12 in both eyes in two patients and 6/9 in both eyes in one patient. In one patient of severe eclampsia visual acuity was 6/12p in both eyes. These 4 patients were subjected to refraction and their best corrected visual acuity was 6/6 in both eyes. The visual acuity was normal (6/6 in both eyes) in 20 patients. Retinal changes (hypertensive retinopathy) were noted in 0 (0%) patients. For all 24 (100%) patients fundus report was observed within normal limit [Table.4 and Fig.4].

Table 4: Fundus finding in patients of PIH

Fundus	Frequency	Percentage
WNL	24	100.0
Abnormal	0	0.0
TOTAL	24	100.0

Fig.4: Fundus finding in patients of PIH (n=24)

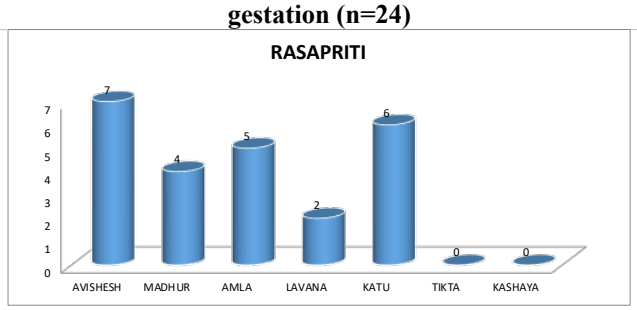


Out of 24 patients, in 7 (29.2%) patients there is no specific *Rasa Sevan* observed, *Madhur Rasa Priti* was observed in 4 (16.7%) patients, *Amla Rasa Priti* was observed in 5 (20.8%) patients, *Lavana Rasa Priti* was observed in 2 (8.3%) patients, *Katu Rasa Priti* was observed in 6 (25%) patients while *Tikta* and *Kashaya Rasa Priti* was not observed in any of the patients [Table.5 and Fig.5].

Table.5: *Rasa Priti* (likeness) and consumption during gestation (n=24)

Rasa	Frequency	Percentage
AVISHESH - No Specific *Rasa Priti*	7	29.2
Madhur	4	16.7
Amla	5	20.8
Lavana	2	8.3
Katu	6	25.0
Tikta	0	0.0
Kashaya	0	0.0
Total	24	100.0

Fig.5: *Rasa Priti* (likeness) and consumption during gestation (n=24)



The association between retinal changes and different excessive *Rasa Sevan:*

There was statistically no significant positive association seen between the presence of retinal changes and excess intake of specific *Rasa* during pregnancy. However, other factors like age, race and gravida were not associated with occurrence of retinopathy in present study.

Discussion

Pregnancy Induced Hypertension is defined as a systolic blood pressure (SBP) >140 mmHg and diastolic blood pressure (DBP) >90 mmHg. The complication rate of PIH in pregnancy is 6-10%. PIH is classified into three types as mild, moderate and severe PIH. Apart from this the pre gestational hypertension also plays an important role in complicating the pregnancy. (6) Immune factor, angiogenic factor, (7) anti-angiogenic factor,(8) positive familial history of pre-eclampsia,(9) oxidative stress are making the disease multifactorial. The cerebrovascular events, nervous system dysfunction, organ failure, hepatocellular injury, thrombocytopenia, abruption placentae, disseminated intravascular coagulation are the complications develops to a woman due to PIH while intrauterine growth retardation, prematurity and intrauterine death are the complications develops to fetus due to PIH. (10) Apart from hemorrhages and sepsis, the PIH is the most dreadful cause of maternal mortality. (11) Some studies have emphasized a need of screening and repeated follow ups are very essential for prevention of PIH related complications to safeguard the maternal and fetal wellbeing. (12)

There is also association of PIH and retinopathy in which generalized arteriolar narrowing, cotton wool

spot, hemorrhages, serous detachment of retina are observed in some studies. (13) The retinal complications can be minimized with the early diagnosis of PIH and early treatment helps to prevent the vision loss. The present study is an effort to establish the association between the excess intake of specific *Rasa* through diet during pregnancy and possible association with retinal changes due to PIH. However hemorrhages, exudates and retinal detachment, etc. was not seen in any of the patients in present study.

Coming to the point of *Rasa*, the word *Rasa* comprises different meaning as per classics. Among them, the one which is perceived through the tongue is known as *Rasa*. (14) According to *Acharya Charak*, there are six type of *Rasa*. (15)

- *Madhur* - Sweet
- *Amla* - Sour
- *Lavana* - Salty
- *Katu* - Pungent
- *Tikta* - Bitter
- Kashay -Astringent

Acharya Sushruta states that combination of different *Mahabhuta* leads to the formation of six *Rasa*. (16) Whereas *Acharya Charak*a explains *Jala* and *Prithvi* as a source *Mahabhuta* of *Rasa* and other three *Mahabhuta* i.e. *Aakash, Vayu, Agni* to percept different type of *Rasa*. (17)

Rasa plays very crucial role to stay healthy and also in process of disease occurrence.

All *Dravyas* are said to be made up of *Panchamahabhuta* so are called *Rasa*. (18) [Table.6]

Table.6: Shows the prime *Mahabhuta* of six *Rasa*

Madhur	*Jala + Prithvi*
Amla	*Prithvi + Agni*
Lavana	*Jala + Agni*
Katu	*Vayu + Agni*
Tikta	*Vayu + Aakash*
Kashay	*Vayu + Prithvi*

The *Rasa* which plays important role in vitiation of *Pitta* and *Rakta Dosha* which leads to vascular pathologies are discussed below. These specific *Rasa* found to be more consumed by the patients in present study

- *Amla Rasa* Action:- *Amla Rasa* is having *Laghu* (easy to digest), *Ushna* (metabolic power), *Snigdh* (unctuous) *Guna*. *Amla Rasa* kindle *Agni* (digestive fire) and helps in digestion of food, provide strengths to body and sense organs. It facilitates easy passage of food forwards stomach by providing necessary moisture. If taken in excessive quantity produces burning in throat, chest and heart, excessive thirst, oedema, fever, Itching sensation, vertigo and produces suppurative inflammation.(19)
  Amla Rasa and *Pitta Dosha* have origin from same *Yoni*, because of which if one of these is affected, another one is aggravated. Due to *Ashraya Ashrayi Sambanda* between *Pitta* and *Rakta*, *Pitta* aggravates *Rakta*. Hence, *Amla Rasa* has direct impact on *Rakta Dhatu*. *Amla Rasa* is originated from *Agni Mahabhuta*. Due similarity in *Mahabhuta* composition, all *Amla Rasa Dravyas* are believed to increase *Pitta* and thereby results in vitiation of *Rakta*. The presence of higher amount of Citric acid (an anti-oxidant) might be the reason for *Amla Rasa Dravyas* to vitiate *Pitta*. (20)
  Amla word is presented as a qualitative word. Though *Amla* has been said as a natural property of *pitta* along with *Katu Rasa*, in Charaka Sutrasthana it is enlisted *Katu* as its original *Rasa* and mentioned that when *Pitta* becomes *Vidagdha* then it takes form of *Amla*. (21)
- *Lavan Rasa* Action :- *Lavan Rasa* is having slightly *Guru* (not very heavy to digest), *Snigdh* (Unctuous) and *Ushna* (Metabolic power) *Guna*. It is digestive in nature and increase taste in food. It removes the obstruction by its *Ushna Guna (Chedana/Bhedana/ Tikshna)*. It produces excessive salivation and dilution of *Kapha* and clears channels and remove obstruction of *Mala*. If taken excessive quantity it produces baldness, bleeding disorders, Alopecia, Excessive thirst, Skin disorders, Gout, Arthritis and Infertility.(22)
  Lavana Rasa results in vitiation of *Pitta Dosha* along with impairment of *Rakta Dhatu*. Excessive use of *Lavana Rasa* causes loosening of *Rakta Dhatu* and *Raktavaha Srotas* as well. Hence, we can say that *Lavana Rasa* causes *Dosha Prakopa* (vitiation of *Pitta Dosha*), *Dhatu Dushti* (*Rakta Dushti*) and *Khavaigunya* (impairment of *Raktavaha Srotas*). (23) Increased salt (*Lavana Rasa*) intake leads to increased sodium and water retention leading to increased blood volume i.e. *Rakta Prakopa*. (24) This suggests that *Lavana Rasa* can lead to formation of vascular pathologies through increased blood volume.
- *Katu Rasa* Action:- *Katu Rasa* having *Laghu* (easy to digest), *Ushna* (metabolic power), *Ruksha* (dry) *Guna*. It kindle the digestive fire and absorbs the month cavity and drain the fluid out from nose and eyes. It pacify the *Ama Dosha* and reduce obesity, cares urticaria and excessive unctuousness. It clears out the infected wound by *Srotoshodhan* (~clearing channels). If taken in excessive quantity it produces infertility, decreases in physical and mental strength, excessive thirst and disease of lumbosacral region. (25)
  Katu Rasa produces dryness and heat in the body .It aggravates *Pitta* and *Vata Dosha*, as it is *Agneya* and *Vayaviya* in nature. (26) "*Sneha Sweda Kleda Malanu Upahanti*" means *Katu Rasa* reduces the amounts of lipids, fats, sticky fluids i.e. mucous and every undesired excreted material. Mucous and debris of dead cells which are responsible for exacerbation are cleaned by *Katu Rasa*. (*Margana Vivranoti*) i.e. widening of channels and reduces the frequency of exacerbation by allowing air to flow freely.(27) Hence the properties of *Katu Rasa* causes vitiation of *Rakta Dhatu* ultimately resulting in *Raktaprakopaj Vyadhi*.

In nutshell, the PIH may show visual disturbances in few patient, but more often can be absent. The association of excessive intake of specific

Rasa not found in present study. However the sample size taken for the study was 24 as per rule of thumb (28) and that can be taken at large to support the present study outcomes. Some of the *Rasa* like *Amla*, *Lavana* and *Katu* are specifically vitiates *Pitta* if taken in excess quantity. *Pitta* and *Rakta* are having same properties and if *Pitta* gets vitiates it deranges the properties of *Rakta Dhatu* and may cause affection of blood vessels causing complications like hemorrhages on retina. In present study total 54.1% of patients are found to consume *Amla* (20.8%), *Lavana* (8.3%) and *Katu Rasa* (25%) more than the usual intake but did not shown any retinal changes. However consumption of these *Pitta* vitiating *Rasa* in excess quantity may precipitated the PIH condition in gestational age. The repeated fundus examination can be recommended in PIH to keep watch on complications and for *Nidanparivarjan* (~to avoid the known disease causing factor in diet and lifestyle) like excessive intake of specific *Pitta-Rakta* vitiating *Rasa*.

Conclusion

Pregnancy induced hypertension is one of the important complication during pregnancy which gives rise to retinal vascular changes in terms of hypertensive retinopathy. These changes may be temporary or permanent causing visual disturbances. Many a time during pregnancy specific *Rasa* has been more consumed by many patients which may leads to complications like PIH and retinal vascular changes. In present pilot study, retinal changes were not seen in any of the patient with PIH in study sample and there was not found to be associated with excess intake of specific *Rasa* and severity of the disease. It can be hypothesized that there must be some association between the specific *Pitta* vitiating *Rasa Sevan* in PIH leading to retinal vascular changes and can be studied on large sample size. Fundus examination is necessary in assessment of the PIH patient.

Scope for further study

The present study is a pilot study and it is a need of hour to study the diseases like retinal vascular changes in PIH. The same can be taken of large sample size with specific *Rasa Sevan* history during PIH with multidisciplinary approach.

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