

REVIEW ARTICLE

Preventive aspect of *Garbhini Vyapada* with special reference to Hypertensive Disorder in Pregnancy

Author: Priyanka Hajare¹

¹Dept. of Prasuti tantra & Stri roga, Mansarovar Ayurvedic Medical College, Hospital & Research Center, Bhopal, Madhya Pradesh, India

ABSTRACT

Garbhini vyapada which includes hypertensive disorder in pregnancy are among obstetrics most commonly occurring complications and yet unsolved problems. It is one of the major causes of maternal and perinatal morbidity and mortality. Globally, the incidence of hypertensive disorder in pregnancy has increased from 16.30 million to 18.08 million from 1990 to 2019, a total increase of 10.92% over two decades. Modern treatment more focused on treatment part, but in Ayurveda preventive aspect plays more important role in order to prevent from developing pathogenesis of disease as well as for curing disease. One of them preventive aspect is the concept of DASH diet. The Dietary Approaches to Stop Hypertension (DASH) diet emphasizes plant-based foods, including vegetables and grains. It is rich in fruit, vegetables and low-fat dairy products. Fruit and vegetable-rich diet is a necessary dietary lifestyle measure now included in the guidelines for the management of hypertension. Fruits advised in Ayurveda literature like *panasa* (Jack fruit), *kadali* (Banana), *dhatri* (Gooseberry) and *draksa* (Grapes) are helpful in prevention & onset of any type of *garbhini vyapada*.

Key Words DASH diet, *Parushaka*, *Quercetin*, *Vitamin D*, *Dhatri*

Received 12 October 2023 Accepted 15th September 2024 Published 10th November 2024

INTRODUCTION

Pregnancy & infection, which contribute significantly to maternal morbidity and mortality and claims the lives of at least one woman in every seven minute. Chronic hypertension is defined by Systolic blood pressure ≥ 140 mm Hg or diastolic blood pressure ≥ 90 mm Hg before pregnancy or before the 20th week of amenorrhea. Gestational hypertension is defined by Systolic blood pressure ≥ 140 mm Hg or Diastolic blood pressure ≥ 90 mm Hg during or after the 20th week of amenorrhea. Preeclampsia is the

occurrence of hypertension and proteinuria after 20 weeks of amenorrhea. Severe preeclampsia is accompanied by clinical signs and symptoms indicating visceral pain. The HELLP syndrome is a severe preeclampsia accompanied by intravascular hemolysis and hepatic cytolysis. Eclampsia is characterized by seizures of the tonic-clonic type. A chronic hypertension is observed in 1-5% of pregnancies. Gestational hypertension without proteinuria appears in 5-6% of pregnancies. A preeclampsia develops in 1-2% of pregnancies, but much more frequently (up

REVIEW ARTICLE

34%) in the presence of risk factors. High blood pressure during pregnancy remains, by its complications, the leading cause of maternal morbidity and mortality.

AIMS AND OBJECTIVES

- (1) To study the preventive aspect of *Garbhini vyapada* with special reference to Hypertensive disorders in pregnancy.
- (2) To decrease the maternal mortality & morbidity by providing proper nutrition in pregnancy.
- (3) To establish the dietary guidelines as per Ayurveda to prevent *Garbhini vyapada* as well as to promote safe motherhood.

METHODOLOGY

Literary references were collected from Ayurveda classics, modern literatures, research journals available on online portals like Pubmed central, Ayush research portal, Google scholar, E-books.

Mechanism of development of Hypertension in Pregnancy

Vitamin D and Renin angiotensin system

Animal and human studies suggest that vitamin D deficiency may increase activity of the renin angiotensin system (RAS), both systemically and in the kidney. In mice, knock out of either vitamin D receptor or the 1 α -hydroxylase gene (which converts 25[OH]D to 1,25[OH]D) up regulates the RAS activity and induces hypertension, and treatment of such mice with

1,25-dihydroxyvitamin D suppresses RAS activity.

Individuals with low 25(OH) D levels found increased systemic and kidney-specific renin angiotensin system (RAS) activation, while hypertension individuals with polymorphisms in the vitamin D receptor also found raised RAS activation. Disturbance of vitamin D signaling in rodents causes activation of the renin angiotensin system (RAS) and cause hypertension. Other Observational studies in humans found low circulating 25-hydroxyvitamin D (25[OH]D) is associated with raised RAS activity and blood pressure.

A randomized control trial carried out to investigate the effects of vitamin D supplementation on the RAS in humans. CI: Vitamin D deficient, (25[OH] D \leq 20 ng/mL), overweight individuals without hypertension. Study design was Randomized double-blind, placebo-controlled trial, with duration of 8 weeks treatment with ergocalciferol or placebo. Assessment criteria was Kidney-specific RAS activity, measured using renal plasma flow response to captopril in high level sodium balance, assessed at baseline and 8 weeks, as was systemic RAS activity and 24-hour ambulatory BP. 84 participants completed the study. Mean 25[OH] D levels increased from 14.7 to 30.2 ng/mL in ergocalciferol group, p-value < 0.0001, and from 14.3 to 17.4 ng/mL in placebo group, p-value = 0.3. Ergocalciferol had no effect on PRA, Ang II, or 24-hour BP measurements.

REVIEW ARTICLE

In Meta- -analysis on Vitamin D and risk of future hypertension on 2,83,537 participants-

A prospective studies evaluating the associations of baseline vitamin D status (circulating 25-hydroxyvitamin D [25(OH) D] levels and dietary vitamin D intake) with risk of hypertension. 08 unique prospective cohorts with aggregate data on 283,537 non-overlapping participants and 55,816 incident hypertension cases were included. The RRs (95% CIs) for hypertension in a comparison of extreme thirds of baseline levels of vitamin D were 0.70 (0.58, 0.86) for seven studies that measured blood 25(OH) D levels and 1.00 (0.95, 1.05) for four studies that assessed dietary vitamin D intake¹. Result was that the pooled RR of incident hypertension per 10 ng/mL increment in baseline 25(OH) D levels was 0.88 (0.81, 0.97) in dose-response analysis. This study demonstrated that Lower levels of 25-hydroxyvitamin D (25[OH] D) are strongly and independently associated with increased risk of developing hypertension.

Role of Quercetin in Hypertensive disorder in pregnancy

Proper blood flow in the uteroplacental unit is result of the presence of vasoactive humoral factors, such as nitric oxide, a crucial regulator of the flow in the uteroplacental unit. Hypertensive disorder in pregnancy development is probably due to imbalance between placental vasoconstrictors and vasodilators. Endothelial nitric synthase localized in uteroplacental endothelium and trophoblasts is suggested to play an important role in the regulation of maternal

and fetoplacental hemodynamics during pregnancy. The interaction between nitric oxide (NO), forms of nitric oxide synthase, and endothelin-1 in fetoplacental unit is strongly associated with and regulates placental blood flow in normal pregnancies and was found to be disturbed in gestational hypertension. Recently, multiple studies report that endothelin-1 levels are increased in Hypertensive disorders in pregnancy and that there is a positive correlation between endothelin-1 and severity of symptoms.

Pregnancy induced hypertension- Oxidative stress

Gestational hypertension is a state of extremely increased oxidative stress due to the decrease of antioxidant capacity. Oxidative stress as an imbalance between free radical generation and antioxidant defense is a recognized key factor in pathogenesis of many diseases including obstetrical complications.

Epidemiological and intervention studies strongly suggest that use of flavonoid has beneficial effects on vascular health. Specific flavonoids were investigated on various models of vascular disorders showing their vasodilator effect and anti-oxidant property, anti-inflammatory, antiatherogenic, and antithrombotic effect.

Plant flavonoids and conjugates belong to large family of natural phenylpropanoid-derived polyphenolic compounds that are commonly found in many species of medicinal plants from different families, i.e., Asteraceae, Lamiaceae, Rutaceae, and Passifloraceae. Health benefits of beverages like tea and wine, foods like fruits and

REVIEW ARTICLE

vegetables, and extracts from medicinal plants are attributed to flavonoids. The protective effects of flavonoids are connected with their antioxidant and vasodilator actions. Vascular endothelial function is considered as a marker in many cardiovascular problems, including hypertension. Endothelium is known to regulate vascular tone by balancing vasoconstriction with vasodilation to provide adequate perfusion pressure to target organs. Moreover, endothelium interacts with leukocytes, thrombocytes, and vessel wall. Results of systematic reviews and meta-analysis studies have shown that a high flavonoid intake is associated with lower mortality from CVD. Quercetin is important representatives of flavonols and one of the most abundant flavonoids widely distributed in apples, berries, onions, tea, green vegetables, and herbs.

In a study on biomarkers of inflammatory process, Quercetin was found to inhibit significantly the production of nitric oxide (NO), inducible NO synthase, interleukin-6, nuclear translocation of nuclear factor- κ B (NF- κ B), extracellular signal-regulated kinase 1/2 (Erk1/2), and c-Jun N-terminal kinase (JNK) in LPS-stimulated macrophages. Quercetin prevented angiotensin II-induced endothelial dysfunction and inhibited protein kinase C activity and vascular superoxide production induced by endothelin-1 in rat aortic ring. Quercetin has been shown to induce a progressive, dose-dependent, and sustained reduction in blood pressure when given chronically in rat models of experimental

hypertension, including spontaneously hypertensive rats (In-vivo).

Two-kidney one-clip (2K1C) hypertensive Wistar rats - model:

- (i) reduction in systolic BP,
- (ii) reduction the hypertrophic remodeling in hypertension by decreasing:
 - (a) Number of vascular smooth muscle cell
 - (b) Excessive production of superoxide anion in hypertensive aorta
 - (c) MMP (matrix metalloproteinase) activity and MMP-2 expression

Wistar rats; Cobalt chloride-induced hypertension;

In vivo: quercetin and vitamin C significantly decreased in the systolic, diastolic and mean arterial blood pressure (MAP) of rats from hypertensive to normotensive values. Ex vivo: quercetin and vitamin C significantly reduced the level of oxidative stress markers.

Research study 1: Provex CV - (combination of extracts from grape seed and skin (330 mg), green tea (100 mg), resveratrol (60 mg) and a blend of quercetin, ginkgo biloba and bilberry (60 mg)) -n = 20, age: 18 - 65 years, male, female, patient with stage 1 hypertension (metabolic syndrome), randomized, double-blinded, placebo-controlled, dosage: supplementation with 28-day treatment periods (330 mg Provex CV/day).

Result: (i) Reduction in diastolic pressure (DP)
(ii) unchanged systolic pressure
(iii) trend to reduction in arterial pressure
(iv) Potentiation eNOS activation and nitric oxide production.

REVIEW ARTICLE

Research study 2: n = 587 participants (299 in quercetin group; 288 in control group), 7 placebo-controlled randomized controlled trials (between 1998 and 2014). Range of dose from 100 to 1000 mg/ day of quercetin per 4 and 10 weeks.

CONCLUSION

(i) statistically significant effect of quercetin supplementation in the reduction of blood pressure (systolic and diastolic BP), possibly limited to, or greater with dosages of >500 mg/day,

(ii) oral quercetin administration was safe and well tolerated.

Management

DASH Diet

Dietary approaches to stop hypertension (DASH) diet is a proven way to prevent and control hypertension and other chronic diseases. DASH diet emphasizes plant-based foods, including vegetables and grains. It is rich in fruit, vegetables, and low-fat dairy products; moderate - meat, fish, poultry, nuts, and beans; Low - sugar-sweetened beverages, sweets, and red meat.

Effect of Dietary Patterns on Blood Pressure

Table 1 Different foods containing flavonoids

Class	Flavonoid	Dietary source
Flavanol	Catechin, Epicatechin Epigallocatechin	Tea
Flavone	Chrysin, apigenin, Rutin, luteolin	Fruit skins, Red pepper, Tomato skin
Flavanol	Kaempferol, quercetin, myricetin, tamarixetin	Onion, Red wine, Olive oil, Berries, and Grape
Flavanone	Naringin, naringenin, taxifolin, hesperidin	Citrus fruits, Grapes, Lemons, Oranges
Isoflavone	Genistin, daidzin	Soyabean
Anthocyanidin	Apigenidin, cyaniding	Cherry, Strawberry

In one research study, 459 adults were enrolled with systolic blood pressures of less than 160 mm Hg and diastolic blood pressures of 80 to 95 mm Hg. For three weeks, they were fed with a control diet that was rich in fruits, vegetables, and dairy products, with a low fat content typical of the average diet in the United States. They were then randomly assigned to receive for eight weeks the control diet, a diet rich in fruits and vegetables, or a "combination" diet rich in fruits, vegetables, and low-fat dairy products and with reduced saturated and total fat. Sodium intake and body weight were maintained at constant levels.

Result: At base line, the mean (+/-SD) Systolic blood pressure - 131.3+/-10.8 mm Hg and Diastolic blood pressure - 84.7+/-4.7 mm Hg. Combination diet - Reduced Systolic blood pressure 5.5 and Diastolic blood pressure by 3.0 mm Hg more, than the control diet (P < 0.001 for each).

Flavonoids: These phenolic plant constituents can be divided into: flavanols, flavanones, flavonols, isoflavones, anthocyanin and flavones depending on the differences in their structures. The hypertension managing effect of fruit and vegetable-rich diet is important dietary lifestyle approach now included in the guidelines for the management of arterial hypertension.

REVIEW ARTICLE

Dadima- Punica on Pregnancy induced hypertension

An extract of *Punica granatum* containing polyphenols i.e. flavonoids and tannins provided protection to endothelial cells stimulated with severe Pregnancy induced hypertension patients' plasma by suppressing production of proinflammatory cytokines (TNF-a and IL-6) and antiangiogenic factors (sFlt-1 and sEng).

Theobroma cacao

A polyphenolic extract from *Theobroma cacao* has been reported to increase cells viability and reduce interleukine-6 and sVCAM-1 levels as well as to increase nitric oxide and decrease endothelin-1 in endothelial cells induced by plasma from PIH patients.

Amalaki – Phenolic contents

The phenolic contents of methanolic extracts of emblica (*Phyllanthus emblica* L.) fruit from six regions in China were measured in this work. The antioxidant activities of these extracts were also evaluated (Figure 1 & 2). Total phenolic content was ranged from 81.5 to 120.9 mg gallic acid equivalents (GAE)/g and the flavonoid content was varied from 20.3 to 38.7 mg quercetin equivalents (QE)/g, while proanthocyanidin content was ranged from 3.7 to 18.7 mg catechin equivalents (CE)/g.

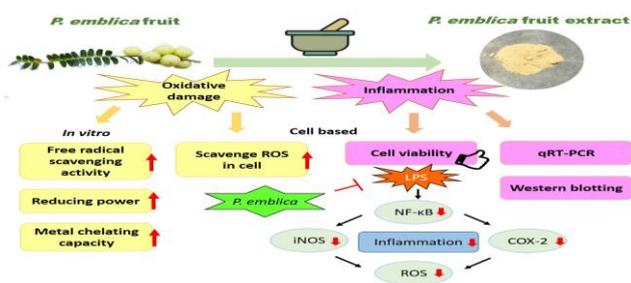


Figure 1 P. emblica fruit Properties

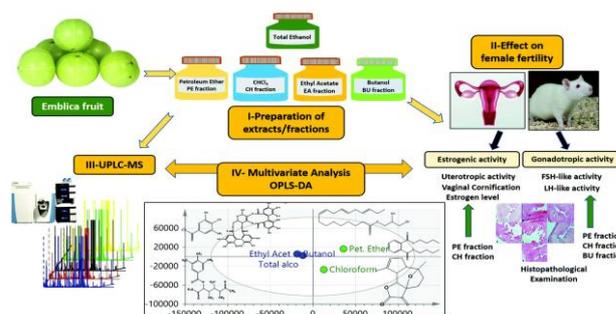


Figure 2 Emblica fruit extract effect on female fertility

Apple - flavonoids

Apples, with the skin, have 4 grams of soluble fiber, which helps lower cholesterol and slows the passage of food through your digestive track. Main phenolic compounds in Apple peel are: Flavonoids (epicatechins, catechins and procyanidins), Rutin, Chlorogenic acid, Photoridzin.

Banana - flavonoids

Bananas belong to anthocyanidin group of flavonoids, containing 7.39 milligrams, while providing protection from free radicals, reports the United state department of agriculture. Bananas are full of healthy nutrients, such as potassium, vitamins A, C and E, lutein, selenium and beta-carotene. One medium banana contains 3 grams of soluble fiber, which slows absorption of glucose into bloodstream, helping to improve blood sugar levels.

Grapes - Draksha

The grape phenolic compounds are mainly found in skin, pulp, and seed. The phenolic compounds in fresh grapes and commercial grape juices may also be beneficial in the prevention of coronary heart disease as they have strong antioxidant activities toward human LDL oxidation (in vitro).

REVIEW ARTICLE

Nutritional requirements as per Ayurveda

Fruits advised are *panasa* (Jack fruit), *kadali* (Banana), *dhatri* (Gooseberry) and *draksa* (Grapes). Rich Protein diet mentioned all through nine months – Milk, Butter, Ghee, Meat soup. Food containing vitamins and trace elements.

Parushaka - *Grewia asiatica* L. - It is one of the drug of *Shramahara Mahakashaya* (*Charaka*). *Madhura, amla, kashaya rasa, laghu guna, sheeta veerya, madhura vipaka, vata pitta shamaka. Sadyogrihita garbha lakshana – shrama* (fatigue) is one of features. *Karma: Hridya, brimhana*. Chemical constituents: β -amyryn, quercetin, aminoacids like proline, phenylalanine, glucose, tannins. Pharmacological activities: antidiabetic, hypotensive.

Chatrika - *Agaricus* -

A mushroom diet reduced risk of gestational hypertension and macrosomia. In a randomized clinical trial, subjects were required to consume 100 g mushroom daily from pre-pregnancy to the 20th week of gestation. Two groups – MD group, Placebo group. A total of 582 and 580 subjects belonging to the MD group and placebo group were included for the analysis, respectively. Compared to the placebo, the MD significantly reduced the incidence of gestational hypertension ($P = 0.023$), preeclampsia ($P = 0.014$), gestational weight gain ($P = 0.017$), excessive gestational weight gain ($P = 0.032$) and gestational diabetes ($P = 0.047$). Stratified analysis showed that the MD lowered the risk of PIH for overweighed women ($P = 0.036$), along with the percentage of macrosomia ($P = 0.007$)².

Role of Nutrients in maintenance of Normotensive state – Proteins, Salts – Sodium

According to Ayurveda *Rasa* circulation – levels of *Rasa dhatu* – to maintain volume – *Madhura rasa pradhana dravya – Draksha, Shashtika shali, Parushaka*.

Vyanatavata normal function – *Madhura, Amla, Lavana pradhana dravya* in which *Madhura varga* includes *Shashtika shali* and *Amla* includes *Dadima, Amalaki*.

DISCUSSION

Similar to the DASH diet, Ayurveda also promotes consuming fresh fruits and vegetables, whole grains, reducing the intake of sodium and preservative added & packed foods. *Embllica officinalis* reduces oxidative stress, prevents development and progression of hypertension by modulating levels of serum NO, activated eNOS endogenous antioxidants, and electrolytes³. *Draksha* works on *Vata Dosha* (*Vyana* and *Apana*). It works as *Anulomaka* through which pressure of *Apana Vayu* on *Vyana Vvayu* and *Pureeshavaha srotas* releases. Therefore, important *hetu* i.e *malavrodha* of hypertension is decreased hence, it's indirectly helps in lowers the blood pressure⁴. Study published in The Journal of Clinical Hypertension reported that people who ate banana for 12 weeks had lower diastolic blood pressure than those who did not eat bananas. The study's authors concluded that bananas may help to lower blood pressure by

REVIEW ARTICLE

increasing the body's potassium levels. Conclusion arising from animal and clinical studies has shown pomegranate juice can reduce Blood pressure in both short-term and long-term course. Their Antioxidant, anti-hypertensive and anti-atherosclerotic actions collectively improve cardiovascular health. Both systolic and diastolic pressures are affected⁵. Consuming between 100 and 150 g/day of whole apples is associated with a lower cardiovascular disease risk and decreases in blood pressure, pulse pressure, total cholesterol, low-density lipoprotein cholesterol, and inflammation status with increases in High density lipoprotein and endothelial function⁶.

prevents from increasing the rates of maternal morbidity and mortality.

CONCLUSION

Hypertension is silent killer of the world which is responsible for heavy morbidity, mortality and economic burden on healthcare system. Due to change in food and work habit of mankind its prevalence is increasing in society. Treatment of this disease is not accomplished with the cure. So the prevention is the main area of interest. It can be achieved by following Ayurveda diet pattern. Blood pressure lowering effect of fruit and vegetable-rich diet is necessary dietary lifestyle measure now included in the guidelines for the management of arterial hypertension. Fruits advised in Ayurveda literature like *panasa* (Jack fruit), *kadali* (Banana), *dhatri* (Gooseberry) and *draksa* (Grapes) are helpful in prevention & onset of any type of *garbhini vyapada*⁷. Thus this

REVIEW ARTICLE

REFERENCES

1. Appel LJ et al, A clinical trial of the effects of dietary patterns on blood pressure, DASH Collaborative Research Group. *N Engl J Med.* 1997;336(16):1117-1124.
2. Kunutsor SK et al, Vitamin D and risk of future hypertension: meta-analysis of 283,537 participants, *Eur J Epidemiol.* 2013;28(3):205-221.
3. Sun L et al, A mushroom diet reduced the risk of pregnancy-induced hypertension and macrosomia: a randomized clinical trial, *Food Nutr Res.* 2020;64:10.29219.
4. Kumar V et al, Amalaki rasayana, a traditional Indian drug enhances cardiac mitochondrial and contractile functions and improves cardiac function in rats with hypertrophy. *Sci Rep.* 2017 Aug 17;7(1):8588.
5. Prof. Vishnu Gogate, *Drvyagunavidnyan*, Vaidyamitra prakashana, 1st edition, 2008, Part 2, *Dravyaguna vidnya vanaspati varnan*, pg. 447.
6. Asgary S et al, Pomegranate Consumption and Blood Pressure: A Review. *Curr Pharm Des.* 2017;23(7):1042-1050.
7. Tewari P.V. *Ayurved Prasuti Tantra Evam Stri Roga- Prasuti Tantra (Obstetrics)*, Part 1 (2011), Chaukhamba Orientalia, Varanasi.