

# Clinical Study of Nutrients Consumption in Normal and Hypertensive Disorders of Pregnant Women

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**Abstract:** *Hypertensive disorders in pregnancy including gestational hypertension and pre-eclampsia are among the most common complications associated with pregnancy, affecting 5-10% of all pregnancies worldwide and some evidence indicated the role of nutrition in the development of hypertensive disorders of pregnancy. The objective of the present study is to evaluate the role of nutrients consumption in normal and hypertensive disorders of antenatal women. The study was conducted in rural area of Chandragiri, Chittoor district, Andhra Pradesh, India for a period of one year between June 2010 – June 2011. Four hundred antenatal women are included in this study. In this study, out of 400 antenatal women, 70 women developed pregnancy induced hypertension. The incidence of pregnancy induced hypertension is more in women who consumed higher intakes of energy, mono unsaturated fatty acids, poly unsaturated fatty acids and lower levels of multivitamins, micro and macro nutrients. The present study concludes that consumption of high doses of total fats including saturated fats, mono and poly unsaturated fatty acids in early pregnancy and lower levels of micro, macro nutrients and multivitamins including potassium, magnesium, copper, vitamin C and vitamin K may increase the risk of developing hypertensive disorders in pregnancy.*

**Keywords:** pregnancy, hypertension, fatty acids, micro nutrients, macro nutrients and vitamins

## 1. Introduction

The incidence of hypertensive disorders of pregnancy is increasing in developing countries affecting 5-10% of total pregnancies. (Robert et al., 2005, Duley, 2009)

The hypertensive disorder is an important cause of maternal and fetal mortality and morbidity. Pregnancy induced hypertension is associated with fetal growth restriction and preterm births, due to induced labour. Even in developed countries the perinatal mortality in pre-eclamptic mothers were 5 times more than non pre-eclamptic mother (James et al., 2003). The world wide prevalence of pre-eclampsia is 5-10% (Olafsdottir et al., 2006).

Factors such as race, parity, maternal age, previous history of hypertension, family history of hypertension and pre-gestational diabetes were established to increase the risk of pregnancy induced hypertension (Oken et al., 2007). During the past two decades some studies have shown that nutritional factors might have an effect on the risk of developing hypertensive disorders of pregnancy (Oken et al., 2007). Patho-physiological changes such as endothelial dysfunction, activation of inflammatory response and oxidative stress were demonstrated in pre-eclampsia (James et al., 2003). Increase in lipid peroxide and free radicals might damage endothelial cells, which lead to changes in nitric oxide synthesis and interferes with prostaglandin synthesis (James et al., 2003). Recent evidence suggested that cytokines are involved in related oxidative stress of pregnancy induced hypertension. Preterm infants, infants of small for gestational age due to intrauterine growth restriction are at higher risk of neonatal mortality, morbidity and development disorders than those born with adequate weight for gestational age (Bocca-Tjeertes et al., 2011, Grisaru-Granovsky et al., 2012). Low birth weight due to intra-uterine growth restriction or prematurity increases the

risk of chronic diseases such as hypertension, myocardial infarction and diabetes in adulthood (Victoria et al., 2008)

Oxidative stress i.e an imbalance between maternal pro-oxidants and anti-oxidants is thought to be involved in the pathogenesis of gestational hypertension and pre-eclampsia (Roberts Hubel, 2004, Scholl et al., 2005). The possible benefits and risks of the use of various dietary supplements on health have been debated (Caudill et al., 1997). While the benefits of some dietary supplements for mother and child have been extensively investigated, e.g., folic acid and iron, the safety of other supplements has not been extensively studied during pregnancy. Micronutrient status may play an important role in pregnancy and birth outcomes. Clinical trials have demonstrated a protective effect of multiple vitamin supplements and folic acid against malformations of the fetus, but few studies have evaluated the relation between hypertensive disorders in pregnancy and multi vitamin use (Hernandez-Diaz et al., 2002). The results of several observational studies have shown the possible role of certain nutrients in the etiology of pregnancy related hypertensive disorders based upon either dietary intake or nutritional biomarker measurements in women who developed hypertension (James et al., 2003, Oken et al., 2007). Some studies indicated higher energy intake in women with hypertensive disorder of pregnancy, whereas others did not observe this association (James et al., 2003). Also lower intake of calcium was mentioned as a risk factor for developing pregnancy induced hypertension in some observational studies.

## 2. Aim and Objectives

1. The aim of the study is to assess the nutritional levels of women with hypertensive disorders during pregnancy.
2. The study compares the consumption of energy, unsaturated fatty acids, micro and macro nutrients and multivitamin supplements in healthy pregnant women

and women who developed pregnancy induced hypertension.

### 3. Methodology

The study was conducted at rural area of Chandragiri , Chittoor district , Andhra Pradesh , India from june 2010-june2011 for a period of 12 months . 400 antenatal women are included in the study. Hypertensives were defined as systolic blood pressure  $\geq 140$  mmof Hg and diastolic blood pressure  $\geq 90$  mmof Hg , which were observed after mid-pregnancy .

Antenatal women with previously diagnosed medical problems like chronic hypertension , diabetes , cardiovascular and renal diseases were excluded from the study.

#### Method of collection of data:

After taking written and informed consent and fulfilling the criteria patients were included in the study

#### Method of study:

Detailed antenatal history including the presence of high risk factors like maternal age , gestational age , gravid , parity , pregnancy interval , pre-pregnancy weight , family history of hypertension and previous history of pregnancy induced hypertension was elicited from the patient and the blood samples were collected at 24 weeks of gestation and sent to bio-chemistry laboratory for analysis of parameters. The intake of energy, fats ,micro and macro nutrients were compared between the two groups. These women were followed till delivery and the women who developed pregnancy induced hypertension were referred to Government Maternity Hospital , Tirupathi.

#### Statistical Analysis:

The data are described by values of mean and standard deviation as well as percentages. Analysis of variants are Kruskal –wallis test depending on the distribution of the data, was used to compare maternal charecteristics and intake data between healthy women and women developing hypertensive disorders . the level of significance was set at  $p=0.05$  and two-tailed p values were used. All statistical analysis were performed using the SPSS programme(SPSS 11.0 for windows ;SPSS Inc.,Chicago. IL,USA).

### 4. Results

**Table 1:** charecteristics and anthropometric measurements of healthy pregnant and pregnancy induced hypertensive women

S.No	Contents	Healthy pregnant women (n=330)(M±SD)	Pregnancy induced hypertension(PIH) (n=70) (M±SD)
1	Age (years)	24±6	30±7**
2	Parity	3.04±0.51	3.94±0.61
3	BMI at first visit (kg/m <sup>2</sup> )	23±3.1	28±3.9**
4.	Weight gain	12.4±3.5	15.9±3.7

	during pregnancy(kg)		
5	Systolic blood pressure at first visit(mm of Hg)	104±8	118±11**
6	Systolic blood pressure at last visit(mm of Hg)	108±12	142±14**
7	Diastolic blood pressure at first visit (mm of Hg )	55±9	66±8**
8	Diastolic blood pressure at last visit(mm of Hg)	64±6	88±9**

The results are expressed in Mean ± Standard Deviation (SD)

\*\* Sgnificant difference between healthy women and women with pregnancy induced hypertension ,  $p \leq 0.001$

Table 1 represents the charecteristics and anthropometric measurements of healthy pregnant and pregnancy induced hypertensive women. The mean age , parity , weight gain were higher in pregnancy induced hypertensive women than in healthy pregnant women. We also found that women with pregnancy induced hypertension had more tendencies to have higher pre-pregnancy BMI , gestational weight gain than healthy pregnant women .

**Table 2:** Mean maternal levels of energy , macro and micronutrients from foods and supplements in healthy pregnant women and women who developed pregnancy induced hypertension

S.No	Daily intake	Healthy pregnant women(n=330) (M±SD)	Pregnancy induced hypertension(n=70) (M±SD)
1.	Energy(kcal)	2345±411	2643±404**
2.	ProteinE%	13.2±1.4	13.4±1.3
3	CarbohydrateE%	46.6±4.8	46.9±4.2
4	Fat (g)	78.6±2.2	96.9±2.2**
5	Saturated fat(g)	23.3±5.6	32.0±5.1**
6	Monounsaturated fattyacids(g)	27.6±5.8	34.9±5.8**
7	Poly unsaturated fattyacids(g)	18.6±4.4	23.4±5.4**
8	Potassium(mg)	4113±844	3891±789**
9	Calcium(mg)	972±298	965±297
10	Iron(mg)	29.8±5.8	28.9±5.9
11	Zinc (mg)	10.6±2.3	10±2.4
12	Magnesium(mg)	311±46.6	277±43.9**
13	Manganese (mg)	1.9±0.2	1.6±0.2
14	Selenium (mg)	57.3±11.2	55.2±12.8
15	Copper (mg)	1023±277	911±235**
16	Vitamin A (RAE)	752±169.3	791±201*
17	Vitamin C (mg)	91.2±13.4	58.2±12.5**
18	Vitamin D (mg)	4.8±0.7	4.4±0.8
19	Vitamin E (mg)	16.8±3.2	13.4±2.6*
20	Vitamin K (mg)	97.2±18.2	72.4±16.2**

The results are expressed in Mean±Standard Deviation(SD)

\*Significant difference between healthy women and women with pregnancy induced hypertension,  $p \leq 0.01$

\*\*significant difference between healthy women and women with pregnancy induced hypertension  $p \leq 0.001$

Table :2 represents nutrient and food intake for the 400 antenatal women included in the study. The incidence of

pregnancy induced hypertension is more in the women who consumed higher intake of energy , total fats ,saturated fat, mono and poly unsaturated fattyacids and low intake of micro ,macro nutrients and multivitamins

## 5. Discussion

Hypertensive disorders remain the leading cause of morbidity and mortality in pregnancy even though outcome for most women and their babies is satisfactory(Meher et al.,2005, Duley, 2003). Furthermore ,there is an increased tendency to ischaemic heart disease in women who have suffered hypertensive disorders during pregnancy(Arnardottir et al.,2005).thus ,prevention of elevated blood pressure during pregnancy is not only a matter of prenatal health care but also important for women's health in general.

The results of the present study shows that higher intake of energy , mono unsaturated fattyacid, poly unsaturated fattyacid increased the risk of pregnancy induced hypertension and consumption of lower levels of potassium, magnesium , calcium , iron ,zinc, manganese, selenium , copper, vitamin A , vitamin C, vitamin D , vitamin E, vitamin K increased the risk of pregnancy induced hypertension than healthy pregnant women. Maternal consumption of mono and poly unsaturated fatty acids in adequate amounts is indeed important for growth and development of the fetus , but the amount and proportion in which various mono and poly unsaturated fattyacids need to be provided for the optimal health of the mother and fetus during the perinatal period is known (Das, 2004).

In several studies obesity was mentioned as a potential risk factor for the development of pregnancy induced hypertension also in the present study women with pregnancy induced hypertension had higher gestational weight gain and pre-pregnancy BMI. So it can be elicited that higher intake of energy before and during pregnancy might lead to obesity, which has then increased the risk of pregnancy induced hypertension. Clausen et al., (2001) observed higher intake of poly unsaturated fatty acids in women with pre-eclampsia which is consistent with the result of the study. Several studies have emphasised the occurrence of dyslipidaemia during pre-eclampsia (Bodnar et al., 2005). But it has not been clear whether either of these changes resulted from disease or dietary intake. It seems that higher intake of unsaturated fat may induce oxidative stress that lead to pregnancy induced hypertension.

## 6. Conclusion

The present study concludes that the consumption of high doses of total fats including saturated fats , mono unsaturated fattyacids, poly unsaturated fatty acids in early pregnancy and lower levels of micro , macro nutrients and multivitamins including potassium, magnesium, copper, vitamin C , vitamin K , may increase the risk of developing pregnancy induced hypertension.

## References

- [1] Arnardottir GA, Geirsson RT, Arngrimsson R, Jonsdottir LS, Olafsson. Cardiovascular death in women who had hypertension in pregnancy : a case-control study BJOG 2005 ;112:286-92.
- [2] Bocca-Tjeertes IF, Kerstjens JM, Reijneveld SA, de Winter AF, Bos AF. Growth and predictors of growth restraint in moderately preterm children aged 0 to 4 years. Pediatrics.2011;128:e1187-94.
- [3] Bodnar LM,Ness RB,Markovic N,et al.The risk of pre-eclampsia rises with increasing prepregnancy body mass index.Ann Epidemiol 2005;15:475-82.
- [4] Caudill MA,Cruz AC,Gregory JF 111,Hutson AD,Bailey LB. Folate status response to controlled folate intake in pregnant women.J Nutr 1997;127:2363-70.
- [5] Clausen T, Slott M, Solvoll K, et al.High intake of energy , sucrose,and polyunsaturated fatty acids is associated with increased risk of pre-eclampsia. Am J Obstet Gynecol 2001;185:451-8.
- [6] Das UN. Perinatal supplementation of long -chain polyunsaturated fatty acids, immune response and adult diseases.Med Sci Monit 2004;10:HY19-25.
- [7] Duley L. Pre-eclampsia and the hypertensive disorders of pregnancy.Br Med Bull 2003;67:161-7.
- [8] Duley L. The global impact of pre-eclampsia and eclampsia.Semin Perinatol.2009;33:130-7.
- [9] Grisaru-Granovsky S,Reichman B, Lerner-Geva L,Boyko V, Hammerman C, Samueloff A, et al. Mortality and morbidity in preterm small -for -gestational -age infants:a population -based study.Am J Obstet Gynecol.2012;206(150):p1-7.
- [10]Hernandez -Diaz S, Werler MM, Louik C,Mitchell AA.Risk of gestational hypertension in relation to folic acid supplementation during pregnancy.Am J Epidemiol 2002 ;156:806-12.
- [11]James MR, Judith LB,Lisa MB,et al.Nutrient involvement in pre-eclampsia. J Nutr 2003;133:1684S-92S.
- [12]Meher S, Duley L. Interventions for preventing pre-eclampsia and its consequences:generic protocol. The Cochrane Database of Systemic Reviews.2005(Protocol).
- [13]Oken E, Rifas-Shiman S, Rich-Edwards J, et al. Diet during pregnancy and risk of pre-eclampsia or gestational hypertension.Ann Epidemiol 2007;17:663-8.
- [14]Olafsdottir AS,Skuladottir GV,Thorsdottir I,et al.Relationship between high consumption of marine fatty acids in early pregnancy and hypertensive disorders in pregnancy.Br J Obstet Gynecol2006;113:301-9.
- [15]Ray JG,Burrows RF,Burrows EA,Vermeulen MJ.MOS HIP:McMaster outcome study of hypertension in pregnancy. Early Hum Dev.2001;64:129-43.
- [16]Roberts CL,Algerts CS, Morris JM,Ford JB,Henderson-Smart DJ. Hypertensive disorders in pregnancy:a population -based study.Med J Aust.2005;182:332-5.
- [17]Roberts JM,Hubel CA. Oxidative stress in pre-eclampsia. Am J Obstet Gynecol 2004;190:1177-8.
- [18]Rugolo LM, Bentlin MR,Trindade CE.Preclampsia :effect on the fetus and newborn. Neoreviews.2011;12:p198-206.

- [19] Scholl TO, Leskiw M, Chen X, Sims M, Stein TP  
.Oxidative stress , diet, and the etiology of  
preeclampsia. Am J Clin Nutr 2005; 81:1390-6.
- [20] Victoria CG, Adair L, Fall C, Hallal PC, Martorell R,  
Richter L, et al. Maternal and child undernutrition  
:consequences for adult and human capital.  
Lancet.2008;371:340-57.

