

A Comparative Study of Blood Pressure in Normal and Pregnancy Induced Hypertensive Cases for Early Diagnosis of Hypertensive Disorders in A Tertiary Care Hospital

Pallavi Kumari¹,
S N Sharma²,
Sumit Kumar³,
Mayur Kumar⁴

¹(M.B.B.S, M.D) Assistant Professor, Dept of Physiology, Teerthanker Mahaveer Medical College and Research Center, Moradabad, ²Professor, Physiology Department, P.M.C.H., Patna, ³(M.B.B.S.,M.D) Assistant Professor, Dept of Microbiology, Teerthanker Mahaveer Medical College & Research Center, Moradabad, ⁴Specialist, Biochemistry, ESI Hospital, Okhla

Corresponding Author: Dr. Pallavi Kumari, Faculty Block-G 304, Teerthanker Mahaveer University Campus, Moradabad. E-mail: drpallavikumar@gmail.com

Abstract

Introduction: Hypertension is one of the commonest complications of pregnancy and is a common cause of fetal and maternal mortality and morbidity. Hypertensive diseases complicate roughly 5-10% of pregnancy after mid gestation (Daftarg 1992). Pregnancy induced hypertension is a multi organ disease. Depending on the end organ effects it can be preeclampsia when renal involvement leads to proteinuria and eclampsia when central nervous system involvement leads to seizures. Despite its major negative implications, its origin remains obscure and the disease process is ultimately reversed only by delivery.

Materials & Methods: In the present study four hundred pregnant women with an age group between 18 to 40 years were selected. This study was done for a period of 2 years. Blood pressure was measured using a sphygmomanometer. All subjects were clinically examined and detailed history was taken.

Results: In the present study blood pressure changes in 400 pregnant women were studied throughout their pregnancy in different trimesters. Among 400 pregnant women under study, 352 women remained normotensive throughout their pregnancy and 48 women developed hypertension during pregnancy. A significant difference in blood pressure between women with hypertension in pregnancy and normotensive pregnant women can be observed since the first trimester, much before the actual clinical diagnosis of hypertension in pregnancy.

Conclusion: Preeclampsia and eclampsia is a very common problem in obstetrics. This study shows the pregnancy associated predictable variation in the blood pressure. On account of variations in blood pressure throughout pregnancy seen in this study, it can be concluded that these variations in blood pressure between healthy and complicated pregnancies may lead to early identification of hypertensive complications in pregnancy as well as to the establishment of prophylactic intervention and reduce the maternal and fetal mortality rate.

Keywords: Eclampsia, Hypertension, Preeclampsia, Pregnancy, Trimesters

INTRODUCTION

Pregnancy is the physiological state. Human pregnancy is the most studied of all the mammalian pregnancies. Childbirth usually takes about 38 weeks after conception, which is approximately 40 weeks from the last menstrual period. The WHO defined normal term for delivery as between 37 weeks and 42 weeks.

A woman's reproductive period is roughly from 15 to 45 years – a period of 30 years.

Pregnancy can be complicated by many involved factors like haemorrhage, infection, preterm labour, cervical insufficiency, hypertension, gestational diabetes etc.

Hypertension is one of the commonest complications of pregnancy and is a common cause of fetal and maternal

morbidity as well as mortality. Hypertension complications are involved in roughly 5-10% of pregnancy cases after mid gestation¹ and 10-15% of all maternal deaths are associated with it.

Despite its major negative implications, its origin remains obscure and the disease process is ultimately reversed only by delivery. However, evidence accumulated in the past 20 years indicate that in a large number of these women abnormal placentation is one of the initial events.

Preeclampsia is a syndrome complex characterized by development of hypertension to the extent of 140/90 mmHg or more with edema or proteinuria or both induced by pregnancy after 20 weeks of gestation. Eclampsia is a preeclamptic state in pregnancy complicated with convulsion.

Pregnancy induced hypertension is a complication involving multiple organs cumulatively. Depending on the end organ effects, it can be preeclampsia when renal involvement leads to proteinuria and eclampsia when central nervous system involvement leads to seizures. The HELLP syndrome can occur as a complication of preeclampsia which is characterized by hemolytic anemia, elevated liver enzymes and low platelet count.

According to Working Group of National High Blood Pressure Education Program (NHBPEP) 2000, the hypertensive disorders can be classified into four types:²

- 1) Gestational hypertension
- 2) Preeclampsia and Eclamptic syndrome
- 3) Preeclampsia syndrome superimposed on chronic hypertension
- 4) Chronic hypertension.

Preeclampsia and Eclampsia

Preeclampsia is multisystem disorder characterised by development of hypertension to the extent of 140/90 mmHg or more with oedema or proteinuria or both after 20 weeks of gestation. Preeclampsia often affects young and nulliparous women.

If there is onset of convulsion in women with preeclampsia and this cannot be attributed to other cause, then it is termed eclampsia. The seizures are generalized and may appear before, during or after labour.

Preeclampsia superimposed on chronic hypertension, predispose to development of superimposed preeclampsia and eclampsia.

The incidence of preeclampsia in primigravidae is about 10% and in multigravidae 5%.³ There is increased

association of preeclampsia with elderly and young primigravidae.

Zhang and associates (2002) reported that the incidence of preeclampsia was doubled in women whose daily intake of ascorbic acid was less than 85 mg.⁴

Villar and associates (2006) showed that calcium supplementation in population with low dietary calcium intake had a small effect to lower perinatal mortality rates, but no effect on the incidence of preeclampsia.⁵

Preeclampsia is principally a syndrome of signs and when symptoms appear, it is usually late.

Hypertension is the most important sign of preeclampsia because it reflects the severity of the disease.

Proteinuria is a sign of preeclampsia which is defined as more than or equal to 300 mg of protein in a 24-hour urine collection. Proteinuria is also valuable as a sign of severity and a value of more than or equal to 5 g in 24 hours is one of the criteria to classify preeclampsia as severe.

Increase in weight and edema are no longer considered signs of preeclampsia. Headaches are usually present in severe forms of preeclampsia. Epigastric pain is also common in patients with severe forms of the disease, particularly HELLP syndrome.

Blurring or diminish of vision or sometimes complete blindness can occur. It usually regains within 4-6 weeks following delivery.

The only possible known treatments for eclampsia or advancing preeclampsia are abortion or delivery either by labour induction or caesarean section.

However, post-partum pre-eclampsia may occur up to 6 weeks following delivery even if symptoms were not present during the pregnancy. Post-partum pre-eclampsia might be dangerous to the health of the mother since she may ignore or dismiss symptoms as simple post delivery headache and edema.

Hypertension can sometimes be controlled with taking anti hypertensive drugs.

Women with underlying inflammatory disorders such as chronic hypertension or autoimmune diseases would likely benefit from aggressive treatment of those conditions prior to conception, tamping down the overactive immune system.

Risk factors associated with preeclampsia include obesity, multi fetal gestation, maternal age older than 35 years and African-American ethnicity.⁶

Conde-Agudelo et al (1993) suggested that mean arterial pressure in the second trimester is a better predictor of gestational hypertension than of preeclampsia.⁷

Andreas et al (2006) reported that abnormal uterine perfusion, independently of the pregnancy outcome, has a significant impact on maternal cardiovascular control. Measures of blood pressure variability, baroreflex sensitivity and heart rate variability might be used for improved risk stratification.⁸

Buchbinder et al. (2002) reported that women with severe gestational hypertension have a higher incidence of preterm birth and small-for-gestational-age newborns than in those with normal pregnancy and with mild preeclampsia.⁹

Ramon C. et al (2001) reported that during the first half of pregnancy, systolic but not diastolic BP is slightly elevated in women who developed gestational hypertension.¹⁰

Monique et al (2008) suggested that high blood pressure before and during early pregnancy is associated with an increased risk of gestational diabetes mellitus.¹¹

Ananth and Basso (2009) reported that the risk for stillbirths was more likely in hypertensive multiparas compared with nulliparas.¹²

There is approximately 30% probability of preeclampsia to recur in future pregnancy. Women who develop preeclampsia are also at high risk for chronic hypertension later in life.

If preeclampsia is detected early, with prompt and effective treatment the preeclamptic features subsides completely and the prognosis is not unfavourable, both for the mother and the baby.

In the present study the pattern of blood pressure changes in pregnant women were studied. This was done throughout their pregnancy in different trimesters, so that the blood pressure changes could be used as a marker in the early diagnosis of hypertension in pregnancy.

MATERIALS & METHODS

In the present study 400 pregnant women of age group 18 to 40 years were selected. Blood pressure was recorded throughout their pregnancy in all the three trimesters. This study was done over a period of 2 years at Patna Medical College and Hospital.

Exclusion Criteria of Subjects

1. Women with diabetes, cardiovascular or renal diseases were excluded
2. None of the women had a history of hypertensive disorders in previous pregnancy
3. Drugs with cardiovascular effects were not given to any women.

All subjects were examined and blood pressure was recorded in the OPD of the obstetrics and gynaecology department between 9 to 11 am to avoid any influence on blood pressure due to diurnal variation.

All subjects were clinically examined and detailed history was taken with reference to duration of pregnancy and previous child birth. Subject's details of obstetrics and gynaecological history along with drug history was recorded

In all the subjects' blood pressure was recorded using sphygmomanometer.

The subjects were made to rest in supine position on the couch comfortably for 10 minutes before blood pressure was taken. They were mentally and physically relaxed and free from excitation and anticipation.

The blood pressure was measured in left arm. The arm with the cuff wrapped around it, was kept at the level of the heart to avoid the influence of gravity. In all the subjects blood pressure was first recorded by palpatory method to get the systolic pressure. Then both the systolic and diastolic pressure was recorded by auscultatory method of blood pressure recording. Three readings were taken at an interval of 2 minutes. The average of those readings were taken as final reading of systolic and diastolic blood pressure.

RESULTS

In the present study blood pressure changes in 400 pregnant women were studied throughout their pregnancy in different trimesters.

Among 400 pregnant women under study, 352 women remained normotensive throughout their pregnancy and 48 women developed hypertension during pregnancy.

Table 1 shows that the mean systolic blood pressure was 114.06 among normotensive women and 123.06 among women with final diagnosis of hypertension in pregnancy in the 1st trimester. The mean diastolic pressure was 66.02 among normotensive women and 74.50 among women with final diagnosis of hypertension in pregnancy in the 1st trimester.

So, Table 1 shows statistically significant ($P < 0.001$) difference of systolic and diastolic blood pressure of normotensive women and women with final diagnosis of hypertension in pregnancy in the Ist trimester.

Table 2 shows that the mean systolic blood pressure was 116.75 mmHg among normotensive women and 130.08 mmHg among women with final diagnosis of hypertension in pregnancy in the IInd trimester. The mean diastolic pressure was 68.82 mmHg among normotensive women and 80.83 mmHg among women with final diagnosis of hypertension in pregnancy in the IInd trimester.

So, this table shows statistically significant ($P < 0.001$) difference of systolic and diastolic blood pressure of normotensive women and women with final diagnosis of hypertension in pregnancy in the IInd trimester.

Table 3 shows that the mean systolic blood pressure was 117.23 mmHg among normotensive women and 146 mmHg among women with final diagnosis of hypertension in pregnancy in the IIIrd trimester. The mean diastolic pressure was 69.32 mmHg among normotensive women and 94.83 mmHg among women with final diagnosis of hypertension in pregnancy in the IIIrd trimester.

So, this table shows statistically significant ($P < 0.001$) difference of systolic and diastolic blood pressure of normotensive women and women with final diagnosis of hypertension in pregnancy in IIIrd trimester.

DISCUSSION

The present study was undertaken to study the pattern of blood pressure changes in pregnancy, which was done throughout the pregnancy in different trimesters.

In the present study 400 pregnant women within age group of 18 to 40 years were selected.

In our study we found that among 400 pregnant women, 48 women developed hypertension in pregnancy and 352 women were normotensive throughout the gestational period.

In the present study the blood pressure of the women with final diagnosis of hypertension in pregnancy in the first trimester of gestation was significantly higher than the women who remained normotensive throughout the pregnancy (Table 1).

Ramon C et al (2000) reported that there is a highly statistically significant difference in the circadian variability of systolic and diastolic blood pressure between normotensive and pregnancy induced hypertensive women during the first fourteen weeks of gestation.¹³

Table 1: Pattern of blood pressure of normotensive women and women with final diagnosis of hypertension in pregnancy in the Ist trimester of gestation

Subject	Blood pressure (mmHg)	
	Systolic	Diastolic
Normotensive N=352	114.06±2.87	66.02±2.79
Hypertensive (final diagnosis) N=48	123.06±2.34	74.50±1.51
't'	20.91	20.71
'p'	<0.001	<0.001

Data are expressed as mean±standard deviation, N=Number of cases

Table 2: Pattern of blood pressure of normotensive women and women with final diagnosis of hypertension in pregnancy in the IInd trimester of gestation

Subject	Blood Pressure (mmHg)	
	Systolic	Diastolic
Normotensive N=352	116.75±2.49	68.82±2.55
Hypertensive (final diagnosis) N=48	130.08±2.56	80.83±2.24
't'	43.09	32.06
'p'	<0.001	<0.001

Data are expressed as mean±standard deviation, N=Number of cases

Table 3: Pattern of blood pressure of normotensive women and women with final diagnosis of hypertension in pregnancy in the IIIrd trimester of gestation

Subject	Blood pressure (mmHg)	
	Systolic	Diastolic
Normotensive N=352	117.23±2.53	69.32±2.48
Hypertensive (final diagnosis) N=48	146.00±2.70	94.83±3.13
't'	73.53	64.80
'p'	<0.001	<0.001

Data are expressed mean±standard deviation, N=Number of cases

Ramon C et al (2001) who studied the ambulatory blood pressure, reported that by 14 weeks of gestation, the predictable trend of blood pressure for women with gestational hypertension and preeclampsia reaches 115/67 mm Hg, for systolic and diastolic blood pressure, whereas the healthy normotensive women have a mean blood pressure at 103/60 mm Hg at the end of first trimester of pregnancy.¹⁰

In our study in the first trimester the mean systolic and diastolic blood pressure of women with final diagnosis of hypertension in pregnancy was 123.06/74.50. The mean systolic/diastolic blood pressure of normotensive woman was 114.06/66.02 (Table 1).

Therefore, a significant difference in blood pressure between women with hypertension in pregnancy and normotensive pregnant women can be observed since the first trimester, much before the actual clinical diagnosis of hypertension in pregnancy.

In our study we found that blood pressure further increases in second trimester of pregnancy in women with pregnancy induced hypertension. The range of blood pressure for diagnosis of preeclampsia was seen in the third trimester of pregnancy (Tables 2 and 3).

In our study although the blood pressure was higher in the hypertensive than in the normotensive women from the first and the second trimester but it was within normal range. The blood pressure at or above 140/90 mm Hg was seen in the third trimester (Table 1-3).

Ramon C et al (2001) also reported that blood pressure increases linearly during the second half of gestation in pregnancy induced hypertension, the average blood pressure values for women who developed gestational hypertension and preeclampsia, are well within the normal ranges of blood pressure variability until the very late stages of pregnancy.¹⁰

Ramon C. et al (2000) reported that the differences in blood pressure between healthy and complicated pregnancies can be observed as early as in the first trimester of pregnancy. Those highly significant differences are found when both systolic and diastolic blood pressure for women with a later diagnosis of gestational hypertension or preeclampsia are well within the accepted normal.¹³

Diana E Ayala et al (1997) reported that the evaluation of predictable variability in blood pressure by the use of ambulatory devices, and the proper processing of the time series thus obtained, can be useful for the early assessment of hypertensive complications in pregnancy.¹⁴

CONCLUSION

The present study revealed that women who had the final diagnosis of hypertension during pregnancy had their blood pressure significantly raised in the first, second, third trimester of gestation as compared to women who had normal blood pressure throughout the gestation.

Hypertension and its related complications of pregnancy (preeclampsia, eclampsia) are very common problem in obstetrics. If left untreated preeclampsia may lead to eclampsia which is a fatal condition.

This study shows the pregnancy associated predictable variation in the blood pressure. On account of variations in blood pressure throughout pregnancy seen in this study, it can be concluded that these variations in blood pressure among healthy and complicated pregnancies may lead to an early identification of hypertensive complications in pregnancy as well as to the establishment of prophylactic intervention and reduce the maternal and fetal mortality rate.

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