

Inter-arm Blood Pressure difference in Women with pregnancy induced hypertension and its clinical significance- A Prospective Study

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Abstract: The present study was carried out to assess the prevalence and the effect of significant blood pressure difference between the right and left arms in patients with Pregnancy induced hypertension. The effects were measured in terms of fetal-maternal outcomes. Of total of 162 subjects were studied, 112 had mild preeclampsia and 50 had severe pre eclampsia. Among these patients significant systolic blood pressure difference was observed in 41 subjects, and significant diastolic blood pressure difference was observed in 51 subjects between the arms. The right arm has higher systolic blood pressures in 26 subjects, and higher diastolic blood pressures in 30 subjects. Left arm has higher systolic blood pressures in 15 subjects and higher diastolic blood pressures in 21 subjects (25 and 31% respectively). Thus the results of this study emphasize the need for measurement of blood pressure measurements in both arms to prevent under diagnosis of hypertension and it is preferable to record blood pressure right arm if single arm is used in order to not to miss hypertension. There were statistically significant differences in occurrence of PPH and caesarean section and IUGR when here was significant difference in the diastolic blood pressure between the arms warranting enhanced care in such a situation.

Keywords: Inter arm blood pressure difference, Maternal and fetal outcome

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I. Introduction

Hypertension is one of the most common medical disorder in pregnancy affects 7-10% all pregnancies. It is associated with fetal and maternal morbidity as well as mortality [1]. Pregnancy induce Hypertension is defined as hypertension that develops as a direct result of the gravid state. It includes gestational hypertension, pre-eclampsia, and eclampsia, chronic hypertension with or without pre eclampsia[2]. Though the ideally blood pressure should be recorded in both the arms, in clinical practice it is not usually carried out. Earlier studies have shown that the prevalence of inter arm difference in systolic and diastolic blood pressure was 10mm of Hg or more in 8.3% and 2.3% of women respectively[3]. In a study by Ray also demonstrated significant differences in inter-arm blood pressure in women with Pregnancy-induced hypertension [4]. This study recommended replication with larger sample. Difference in the blood pressure in non pregnant women also shows poor outcome when there is marked difference in inter-arm difference. This difference in blood pressure between two arms is associated with aortic dissection/ Coarctation of aorta, peripheral vascular diseases in the mother. Buchbinder *et al* reported that women with severe gestational hypertension have higher incidence of pre-term birth and small for gestational age newborns than in those with normal pregnancy and with mild preeclampsia [5].

Hence the present study was carried out assess the prevalence and the effect of significant blood pressure difference between the upper limbs in PIH complicating pregnancy.

II. Subjects and Methods

The present prospective observational analytical study was carried out in patients with pregnancy induced hypertension who are admitted in Government Maternity Hospital affiliated to , Sri Venkateshwara Medical College, Tirupati, Andhra Pradesh , South India, for a period of six months.

2.1. Inclusion criteria

All diagnosed subjects of pregnancy induced hypertension

2.2. Exclusion criteria

- Women with prior history of preexisting hypertension, cardiovascular diseases before pregnancy.
- Use of drugs with cardiovascular side-effects.
- Women who cannot sits for BP recording.
- Not willing to participate in the study.

2.3. Study methodology:

In this study the blood pressure readings were taken at an interval of 2 minutes in both the arms in all the subjects. Blood pressure was recorded in sitting posture with her arm supported in horizontal position at the level of heart using a standard calibrated Sphygmomanometer. Women are allowed to take rest for 10 minutes prior to examination. First, right arm measurement was taken and followed by left arm measurement. At first blood pressure is measured with palpatory method to get systolic blood pressure to exclude problem of auscultatory gap. Then both systolic and diastolic blood pressure is recorded using auscultatory method. Disappearance of Kortokoff V is used to determine diastolic blood pressure. Kortokoff IV is used if sound persists when cuff is deflated. Measurements taken from the arm with highest systolic, diastolic blood pressure are individually analyzed. Significant inter-arm blood pressure difference is considered to be present if the difference between the two arms in the average of last two measurements is more than or equal to 5mm of Hg in systolic or diastolic blood pressure. This cut off value is arbitrarily decided because minimum difference of 5mm is expected [6, 7 & 8].

2.3. Data Analysis

All the information collected and recorded in the pre designed pro forma. The data was entered in MS excel 2007 Microsoft corporation publication and analyzed using Epi Info CDC Version 7.2.0.1 Statistical significance for continuous variables was tested using student t-test and discrete variables using CHI-SQUARE test. Frequencies were described using percentages.

2.4. Ethical considerations

Informed consent was taken from all the patients before including them in the study and confidentiality of details of the subjects was maintained.

III. Results

In this prospective study, a total of 162 subjects were studied. Among them, 112 had mild hypertension and 50 had severe hypertension. Significant inter-arm systolic blood pressure difference was observed in 41 subjects, and significant inter- arm diastolic blood pressure difference was observed in 51 subjects. In significant inter arm blood pressure subjects, maternal characteristics, maternal and fetal outcome results are tabulated below.

Table 1: Correlation of systolic and diastolic inter arm BP difference and maternal characteristics

| Maternal characteristics | Systolic inter-arm blood pressure difference | | | Diastolic inter-arm blood pressure difference | | |
|-------------------------------|--|-------------------|-----------------|---|-------------------|-----------------|
| | No difference in B.P | Difference in B.P | Significant SBP | No difference in B.P | Difference in B.P | Significant DBP |
| Maternal age in years. | | | | | | |
| Teenage 15-21 | 27 | 4 | 1 | 29 | 2 | 1 |
| Adult women | 107 | 6 | 1 | 105 | 7 | 2 |
| Elderly (>35) | 08 | 6 | 2 | 10 | 4 | 2 |
| BMI(kg/m²) | | | | | | |
| 18.5-24.9 | 109 | 12 | 3 | 116 | 6 | 3 |
| 25-29.9 | 18 | 4 | 2 | 15 | 2 | 5 |
| 30 and greater | 15 | 2 | 2 | 15 | 1 | 1 |

The above table shows significant inter arm blood pressure difference more in elderly pregnant subjects and also shows there is a significant inter-arm blood pressure difference in women with BMI more than 25 kg/m².

Table 2: Frequency of maternal outcome

| S.No. | Maternal outcome | Frequency | Percent |
|-------|-------------------------------|-----------|---------|
| 1 | Abruption | 5 | 3.09% |
| 2 | Caesarian section | 46 | 28.40% |
| 3 | Caesarian section , PPH | 4 | 2.46% |
| 4 | Caesarian section , Abruption | 3 | 1.85% |
| 5 | HELLP | 1 | 0.62% |
| 6 | No complications | 92 | 56.79% |

| | | | |
|---|----------------|-----|---------|
| 7 | PPH | 8 | 4.94% |
| 8 | Preterm labour | 3 | 1.85% |
| | Total | 162 | 100.00% |

Table 3: Frequency of fetal outcome

| S.No. | Fetal outcome | Frequency | Percent |
|-------|-----------------------|-----------|---------|
| 1 | Birth asphyxia | 8 | 4.94% |
| 2 | Birth asphyxia IUGR | 1 | 0.62% |
| 3 | IUD | 7 | 4.32% |
| 4 | IUGR | 20 | 12.35% |
| 5 | IUGR , birth asphyxia | 3 | 1.86% |
| 6 | Neonatal death | 1 | 0.62% |
| 7 | NICU admission | 2 | 1.23% |
| 8 | No complications | 107 | 66.05% |
| 9 | SGA | 8 | 4.94% |
| 10 | SNCU admission | 5 | 3.09% |
| | Total | 162 | 100.00% |

Table 4. Maternal out come in patients with significant systolic blood pressure difference

| S. No. | Maternal outcome | Number of subject significant SBP | P Value |
|--------|-------------------|-----------------------------------|---------|
| 1 | Abruption | 2 | 1.20 |
| 2 | Caesarian section | 17 | 0.16 |
| 3 | PPH | 4 | 0.60 |
| 4 | HELLP syndrome | 1 | 0.08 |

Table.5 Maternal out come in patients with significant diastolic blood pressure difference

| S. No. | Maternal outcome | Number of subject significant DBP | P Value |
|--------|-------------------|-----------------------------------|---------|
| 1 | Abruption | 3 | 0.70 |
| 2 | Caesarian section | 25 | 0.002* |
| 3 | PPH | 9 | 0.007* |
| 4 | HELLP syndrome | 1 | 0.57 |
| 5 | Pre-term labor | 1 | 0.94 |

The above table shows statistically significant P value in Caesarean section and PPH.

Table.6- Fetal outcome in patients with significant systolic blood pressure difference

| S. No. | Fetal out come | Number of subject significant SBP | P Value |
|--------|----------------|-----------------------------------|---------|
| 1 | Birth asphyxia | 4 | 0.50 |
| 2 | IUFD | 4 | 0.04* |
| 3 | IUGR | 6 | 0.93 |
| 4 | SGA | 2 | 1.20 |
| 5 | SNCU admission | 1 | 0.78 |

The above table shows statistically significant occurrence of Intra uterine fetal death in patients with significant systolic blood pressure difference

Table 7: Fetal outcome in patients with significant Diastolic blood pressure difference

| S. No. | Fetal out come | Number of subject significant DBP | P Value |
|--------|----------------|-----------------------------------|---------|
| 1 | Birth asphyxia | 4 | 0.88 |
| 2 | IUFD | 5 | 0.19 |
| 3 | IUGR | 13 | 0.005* |
| 4 | SGA | 4 | 0.24 |
| 5 | SNCU admission | 2 | 0.88 |

The above table shows statistically significant P value in IUGR. in patients with significant Diastolic blood pressure difference

IV. Discussion

Results of the present study underlines th importance of recording blood pressure in both the arms in patients suffering from hypertension complicating pregnancy since 25.30% and 31.48% respectively had significant inter-arm systolic and diastolic blood pressures respectively. It is also notable such differences show increases in certain feto-maternal adverse out comes. .

In clinical practice, if BP is measured only in one arm, the pregnant woman may be wrongly diagnosed as normo tensive, because the e BP in the other arm may reveal the true hypertensive state. According to AHA’s guidelines for hypertensive patients the arm with the higher pressure should be used to guide clinical decisions [10].

The present study shows that right arm has higher systolic blood pressures in 26 subjects has higher diastolic blood pressures in 30 subjects. Left arm has higher systolic blood pressures in 15 subjects and higher

diastolic blood pressures in 21 subjects. Hence, the results of study emphasizes the need for measurement of blood pressure measurements in both arms to prevent under diagnosis of hypertension.

The present study shows that subjects with significant inter-arm diastolic blood pressure differences have higher incidences of caesarean sections, PPH and IUGR showing the importance of difference in inter-arm diastolic blood pressures in predicting the maternal and fetal outcome.

Ray *et al.* observed that clinically significant differences were measured between arms in the systolic pressure compared with the diastolic or mean pressure. Though this study differs from our study it signifies the importance of measurement of blood pressure in both arms in the initial assessment of hypertensive patients [4].

Niels *et al.*, stated that for a reliable estimation of the inter-arm BP difference, simultaneous measurement should be preferred over sequential BP assessment at a patient's initial visit as it is less influenced by order effects compared with sequential BP measurement and results in smaller inter-arm BP differences [9]. But it is practically difficult to measure blood pressure so it was not adapted in the present study.

Poon *et al* stated that with pregnancy being a window of opportunity for a healthcare system to screen most women of reproductive age for risk factors of cardiovascular disease one should attempt to get maximum information like actual blood pressure levels, inter-arm differences and pulse pressure differences during any antenatal visit [3]. The authors of the present study also concur with the above authors and recommend that blood pressure should be recorded in both arms of the pregnant women at least in first visit so as to not to miss significant inter-arm difference. But it will be ideal to record blood pressure in both the arms once the women is diagnosed to be affected with hypertension.

V. Conclusion

In compromised conditions(E.g. Lack of time) where blood pressure recording cannot be done in both the arms the results of this study suggests to record blood pressure in right arm if single arm is used in order to not to miss hyper tension. Since **it** helps in guiding for the prevention of hypertension related complications like PPH and caesarean section and IUGR once again recording of blood pressure in both the arms is strongly recommended.

Since the sample size was not determined scientifically and blood pressure recording was not done simultaneously further studies are recommended.

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