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Blood Pressure Patterns in Undernourished Pregnant Women of Rural Varanasi

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OBJECTIVES – To study blood pressure variations in pregnant women in rural Varanasi. **METHODS** – A total of 4500 women were enrolled in the study to compare the results in Integrated Child Development Services and non-Integrated Child Development Services blocks for the ranges, mean and standard deviation of blood pressure in the non-pregnant state and during the three trimesters. **RESULTS** – Majority of the pregnant women showed the blood pressure to be in the normal range, with hypertension being present in < 1%. Factors of significance in these women were low socio-economic index, under nutrition and illiteracy. **CONCLUSION** – Probable association of poor nutrition and low socio-economic status with low prevalence of pregnancy induced hypertension could be responsible for the high incidence (26.4%) of low birth weight neonates. Rural pregnant women involved in heavy physical activity did not show rise in blood pressure during pregnancy.

Key words : blood pressure in pregnancy, under nourished pregnant women, rural area

Introduction

Pregnancy induced hypertension (PIH) is a syndrome of hypertension with or without proteinuria and edema, with the clinical manifestation usually occurring late in pregnancy and regressing after delivery of the fetus. It is a major pregnancy complication causing preterm birth, fetal growth retardation, abruptio placentae, and fetal death, as well as maternal morbidity and mortality. The reported incidence of PIH shows great variation, which may be attributable to differences in definition, population composition, and demographic and obstetric characteristics[1]. The present study examines the blood pressure (BP) variations in undernourished pregnant women in rural Varanasi.

Material andMethods

The study was conducted in randomly selected 28 villages of Harahua (Integrated Child Developmental Services – block population 33770), 21 villages of Kashi Vidyapeth (non-Integrated Child Developmental Services – block population 32307) and the adjoining blocks of Varanasi district during 1988-94. The mean age of the study women was 26.0±0.1 years and mean parity 3.6±0.04. The mean per capital income was Rs.178±1.3 and Rs.159±1.2 in the Harahua and Kashi Vidyapeth areas, respectively. Majority of the women were illiterate – 88% in Harahua and 84% in Kashi Vidyapeth block. Occupation wise, 99% of the women in these rural areas were housewives. Low birth weight accounted for 27.4% and preterm delivery for 6.6%. Mean maternal weight gain during pregnancy was 6.9± 1.1 kg with mean term weight of 50.51 kg. Fetal weight gain was severely affected during 36 to 41 weeks of gestation being 5.53gm / week only. There was significant reduction in birth weight and length, important determinants being gestation, weight gain in pregnancy, caloric intake in third trimester, pregnancy interval and hard physical activity[2-6].

Pregnant women were followed during this period for blood pressure measurements in the three trimesters during antenatal visits. Blood pressure was measured with a sphygmomanometer in the upright sitting position. All subjects were required to rest quietly alone in a room for at least 5 minutes before the blood pressure readings were taken. Korotokoff phase V was used to measure diastolic pressure. In all, 4500 women were enrolled during this period and results analyzed in the Integrated Child Development Services (supplemented and nonsupplemented women) and non-Integrated Child Development Services groups for the ranges, mean and standard deviation of BP in the non-pregnant state and in the three trimesters (8 ±2, 16±2, 32±2 weeks).

Birth weight was recorded within 72 hours of delivery on a modified Tansi scale. Statistical analysis was done and mean and standard deviations were calculated. Multiple regression analysis was also performed to see the influence of BP (third trimester) on birth weight. SPSS – package was used.

Results

Tables I and II show the systolic and diastolic BP records of the study women. In the non-pregnant group, majority

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of the women had BP below 140/90mm Hg (normotensive). The prevalence of hypertension in these rural women was very low with only less than 1% showing systolic BP>139 mmHg . The diastolic pressure was below 90 mm Hg in all the women. In the first trimester, all the three groups (supplemented, unsupplemented and non-Integrated Child Development Services block women) showed BP below 140/90 mmHg. In the second trimester only 0.2% women were diagnosed to have BP above 140/90 mmHg. The systolic BP in the third trimester was <120mm Hg in 98.77% 99.23% and 99.28% in the supplemented, unsupplemented and non-Integrated Child Development Services groups respectively. The diastolic BP was < 80mmHg in 80.95%,99.2% and 99.17% in the above three groups respectively. Systolic BP >139 was seen in 1.10%, 0.13% and 0.11% in the three groups respectively. The diastolic pressure of >90mmHg was seen in only 1.10%. 0.13% and none in the three groups respectively. Prevalence of hypertension was found to be as low as 0.1%. The mean systolic pressure was between 100.2 and104.1 mmHg in the three groups of women and the diastolic pressure ranged from 63.3 to 68.5 mmHg. (Tables I and II).

No significant alteration of BP was found between the pregnant women in the Integrated Child Development Services (supplemented and un-supplemented) and non-Integrated Child Development Services groups, showing no correlation with food supplementation. However, this rural area projected a very low prevalence of hypertension in pregnant women. There was no correlation between maternal weight gain and systolic or diastolic BP in third trimester – Mean ± SE being 0.004 ± 0.003 and 0.001 ± 0.004 ($p > 0.1$ for both).

Multiple regression analysis was performed to find out the influence of third trimester BP (systolic and diastolic) on birth weight in the non-Integrated Child Development Services blocks. There was no influence on combined data, as well as in different birth weight categories (Table III). The observations were similar in the Integrated Child Development Services blocks (supplemented and un-supplemented) as seen in Table IV.

Table 1 – Percentage distribution of women according to systolic BP (mmHg)

	Pre-pregnancy			1st-trimester			2nd-trimester			3rd-trimester		
Systolic BP	A n=930	B n=1910	C n=1518	A n=1007	B n=1949	C n=1881	A n=1835	B n=1606	C n=1849	A n=972	B n=1561	C n=1802
<121	98.49	98.12	99.74	98.01	98.26	99.63	98.72	98.69	99.30	98.77	99.23	99.28
121-129	0.22	0.26	0.13	0.50	0.36	0.05	0.43	0.19	0.11	0.10	0.26	0.11
130-139	1.29	1.47	0.07	1.49	1.03	0.32	0.86	0.87	0.43	1.03	0.38	0.50
>139	-	0.16	0.07	-	0.36	-	-	0.25	0.16	1.10	0.13	0.11
Mean ± SE	102.51 ± 0.31	104.13 ± 0.22	102.84 ± 0.15	102.90 ± 0.31	104.51 ± 0.23	103.86 ± 0.14	100.27 ± 0.32	101.69 ± 0.25	104.06 ± 0.15	103.25 ± 0.30	103.68 ± 0.24	104.16 ± 0.16

A- Suplemented B – Unsupplemented C – Non – ICDS

Table II – Percentage distribution of women according to diastolic BP (mmHg)

	Pre-pregnancy			1st-trimester			2nd-trimester			3rd-trimester		
Diastolic BP	A n=930	B n=1910	C n=1515	A n=1006	B n=1948	C n=1879	A n=1935	B n=1606	C n=1849	A n=972	B n=1559	C n=1801
<70	80.32	77.07	93.99	80.02	78.08	92.71	83.21	82.44	93.24	75.00	75.43	92.06
121-129	18.60	21.73	5.68	18.70	20.89	6.87	15.54	17.00	17.00	5.95	23.77	7.11
130-139	1.08	1.20	0.33	1.19	0.92	0.27	0.86	0.50	0.70	1.13	1.09	0.83
> 139	-	-	-	-	0.10	0.16	-	0.06	0.11	1.10	0.13	-
Mean ± SE	66.96 ± 0.23	67.70 ± 0.16	63.31 ± 0.14	67.48 ± 0.22	67.85 ± 0.16	63.86 ± 0.13	66.51 ± 0.23	66.69 ± 0.18	63.68 ±0.14	68.58 ± 0.23	68.04 ± 0.19	64.19 ± 0.15

A – Supplemented B – Un-supplemented C – Non-ICDS

Table III – Blood pressure (mmHg) in different birth weight groups and calculated multiple regression with birth weight and 3rd trimester BP in non-Integrated Child Development Services blocks.

Birth weight (gms)	Systolic BP Mean ± SD (Range)	Diastolic BP Mean ± SD (Range)
<2500 (n = 413)	104.1 ± 7.59 (80 – 90)	63.7 ± 5.83 (40 – 92)
Analysis of variance	0.116	0.002
P - value	0.734 (NS)	0.964 (NS)
2500 to 3000 (n = 936)	103.9 ± 6.85 (80 – 170)	63.8 ± 5.99 (30 – 100)
Analysis of variance	3.043	0.169
P value	0.082 (NS)	0.680 (NS)
> 3000 (n = 215)	105.2 ± 6.80 (90 – 138)	64.8 ± 6.43 (48 – 100)
Analysis of variance	0.262	2.418
P value	0.610 (NS)	0.1219 (NS)
All combined (n = 1564)	104.1 (80 – 190)	63.9 ± 6.02 (30 – 100)
Analysis of variance	2.519	3.467
P value	0.113 (NS)	0.063 (NS)

NS – Not significant

Table IV – Blood Pressure (mmHg) in different birth weight groups and calculated multiple regression with birth weight and III trimester BP in blocks with Integrated Child Development Services (Supplemented and un-supplemented groups).

Birth weight (gms) Mean ± SD (Range)	Systolic BP Mean ± SD (Range)	Diastolic BP
<2500 (n = 420)	102.1 ± 7.41 (82 – 90)	64.7 ± 5.71 (42 – 92)
Analysis of variance	0.109	0.018
P value	0.724 (NS)	0.961 (NS)
Z 2500 < 3000 (n = 900)	104.9 ± 6.76 (82 – 170)	64.8 ± 5.90 (36 – 100)
Analysis of variance	3.034	0.167
P value	0.081 (NS)	0.678 (NS)
Z 3000 (n = 222)	102.9 ± 6.60 (88 – 136)	62.8 ± 6.40 (46 – 98)
Analysis of variance	0.260	2.398
P value	0.608 (NS)	0.1210 (NS)
All combined (n = 1542)	102.1 ± 7.10 (82 – 192)	64.8 ± 6.04 (34 – 98)
Analysis of variance	2.510	3.470
P value	0.111 (NS)	0.067 (NS)

NS – Not significant

Discussion

Pregnancy induced hypertension is a highly prevalent pregnancy complication with adverse effects on maternal and fetal health. Epidemiological research concerning its etiology is limited. The BP normally falls at the beginning of pregnancy and reaches its lowest level in the second trimester when the diastolic BP in the lying position is on an average, 15 mm Hg lower and the systolic BP 5 mm Hg lower than prepregnancy levels. The fall in BP in the first two trimesters occurs in both normotensive and hypertensive women. The BP however normally rises in the third trimester and reaches pre-pregnancy levels by term. Based on several carefully designed, well-controlled recent clinical trials, the prevalence is 5 to 9% for gestational hypertension and 5 to 7% for pre-eclampsia[7,8]. However, in India no community studies are available. Epidemiological studies in Thailand have shown prevalence of diastolic BP>90 mm Hg in approximately 20%. PIH was observed in about 6% of the pregnancies and these were associated with increase in low birth weight deliveries[9].

In the present study, majority of the rural women showed BP in normal range, hypertension being present in less than 1%. Factors of significance in these women were – (a) low socio-economic status (b) undernutrition (c) low weight gain in pregnancy and (d) illiteracy. Almost all pregnant women were doing hard to moderate physical activity and 99% were housewives doing heavy household chores and working in the fields in the rural setup. Probable association of poor nutrition and low socio-economic index with low prevalence of hypertension in pregnancy could be responsible for 26.4% low birth weight babies (Table III and IV).

Sparks et al[10] in their study on 1110 women in rural Zimbabwe showed PIH to be rare with a prevalence of 0.8%, 1.3% and 3.2% in communal lands, commercial farms and mining areas respectively. Irwin et al[11] in their study showed significantly decreased risk of PIH in nulliparas employed in jobs involving high levels of physical activity. These findings of maintaining normal BP in rural undernourished women doing heavy physical activity were also observed in earlier studies by Lechtig et al[12]. Canosa[13] also observed low BP in rural undernourished pregnant women with heavy physical activity who gave birth to more low birth weight babies.

It can be concluded on the basis of the present study data and the findings by other authors refered above that rural undernourished pregnant women having heavy physical activity, do not show rise in BP during pregnancy.

References

1. Redman C W G. Hypertension. In: de Swiet M ed. Medical Disorders in Obstetics Practice. 4th ed. *Massatusett, USA. Blackwell Publishing Co. 2000; 159-97.*
2. Agarwal DK, Agarwal A, Singh M et al. Pregnancy wastage in rural Varanasi: Ralationship with maternal nutrition and socio-demmograhic characteristics. *Ind Pediatr 1998;35:1071-9.*
3. Agarwal DK, Agarwal KN, Satya K et al. Weight gain during pregnancy – A key factor in perinatal and infant mortality. *Ind Pediatr 1998;35:733-43.*
4. Agarwal KN, Agarwal DK, Agarwal A et al. Impact of the Integrated Child Development Services (ICDS) on maternal nutrition and birth weight in rural Varanasi. *Ind Pediatr 2000;37:1321-7.*
5. Agarwal S, Agarwal A, Agarwal KN et al. Physical activity and pregnancy outcome in rural undernourished women. *Ind Pediatr 2001; 38:1017-22.*
6. Agarwal S, Agarwal A, Bansal AK et al. Birth weight patterns in rural undernourished pregnant women. *Ind Pediatr 2002;39:244-53.*
7. Sibai BM, Caritis SN, Thom E et al. Prevention of pre-eclampsia with low dose aspirin in healthy, nulliparous pregnant women. The National Institute of Child Health and Human Development Network of Maternal-Fetal Medicine Units. *N Engl J Med 1993;399:1213-8.*
8. Hauth JC, Goldenberg RL, Parker CR Jr et al. Low-dose aspirin therapy to prevent pre-eclampsia. *Am J Obstet Gynecol 1993; 168:1083-93.*
9. Phuapradit W, Chinsomboon S, Benchakarn V et al. Epidemiology of hypertensive disorder of pregnancy and childbirth: population based study, Thailand. *J Med Assoc. Thai 1993;76:196-202.*
10. Sparks BT, Mufunda J, Masabayane CT et al. Prevalence of hypertension among women in rural Zimbabwe: a comparison of pregnant and non-pregnant women. *Cent Afr J Med 1996; 42:93-7.*
11. Irwin DE, Savitz DA, Andre KA et al. Study of occupational risk factors for pregnancy-induced hypertension among active duty enlisted navy personnel. *Am J Ind Med 1994; 25:349-59.*
12. Lechtig A, Delgadoh H, Martorell R et al. Effect of food supplementation on blood pressure and prevalence of edema and proteinuria during pregnancy. *Trop Pediatr Env Ch Hith 1978;24:70-6.*
13. Canosa CA. Intrauterine growth retardation in India and Bangladesh. In : Senterre, ed. *J Intrauterine growth retardation. Nestle Nutrition workshop series. Vol 18 New York Raven Press. 1989:183-204.*