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Original Article

Hypertension in Pregnancy Affects the Placental Weight and Fetal Outcome

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Abstract

Background: Hypertensive disorders of pregnancy and their complications rank as the major cause of maternal and perinatal mortality and morbidity. The placenta reflects the complications of hypertension and also provides the exact status of a baby's gestational time. **Materials and Methods:** The study was carried out in Department of Anatomy, Rangpur Medical College, Rangpur from July 2014 to June 2015 on 60 (sixty) human placenta 30 from normotensive mothers (control group) and 30 from hypertensive mothers (hypertensive group). The placenta was selected from the obstetric ward of Gynecology and Obstetrics Department, Rangpur Medical College Hospital, Rangpur after taking written permission. Birth weight was recorded. The weight of the placenta was measured using standard procedure. **Results:** The mean (± SD) of weight of placenta in hypertensive and control groups were (331.10 ± 67.54 gm vs 436.27 ± 55.61 gm, $p<0.000$). The mean (±SD) birth weight of baby in hypertensive and control groups were 2.24±0.51 kg vs 3.05±0.35 kg, ($p<0.000$) and the mean feto-placental weight ratio in hypertensive group was 6.87±1.42 and in control group 7.04±0.70. **Conclusion:** The weight of the placenta as well as birth weight of baby was reduced in pregnancies complicated with hypertension. The reduction of birth weight of the baby was proportional to the reduction of placental weight.

Keywords: Placental weight, Birth weight, Hypertension in pregnancy.

Introduction

The placenta is unique organ; it is fastest growing,[1] short lived by design, its brief existence ensures survival of human fetus in the intrauterine environment,[2] The placenta performs diversity of functions, ranging from anchoring the fertilized ovum, preventing its rejection by the maternal immune system to enabling the transport of nutrients and wastes between the mother and fetus.[3] So, the wellbeing of the fetus is affected by many factors but a healthy placenta is the most important factor in producing a healthy baby. Yet most of the time following delivery, placenta is consequently set aside, forgotten or put into storage for subsequent disposal. Examination of the placenta gives a clear idea of what had happened in the mother's womb and what is going to happen with the fetus in the future.[4] The expelled mature placenta weighs 470g (range 200-800g),[5] approximately one sixth of the birth weight of the baby.[6] The placental weight is a significant parameter reflecting fetal development during pregnancy and, on a population basis, may predict the development of diseases in adulthood.[7] Hypertension is one of the common complications of pregnancy and contributes significantly to maternal and perinatal mortality and morbidity.[8] Hypertensive disorders of pregnancy and their complications rank as the major cause of maternal mortality in the low-income countries of the world and accounts for 16%;[9] in Bangladesh 20%.[10] In addition, hypertensive disorders are strongly associated with fetal growth restriction and prematurity.[8] Pregnancy complicated by hypertension is commonly associated with placental insufficiency.[11] Increased resistance to utero-placental circulation adversely affects the growth and structure of placenta.[12] This study reveals the changes in placental weight in relation to fetal outcome in pregnancies associated with hypertensive disorders in northern region of Bangladesh.

Materials and Methods

This is a cross sectional analytical study. The study was carried out on 60 (sixty) human placenta; 30 were collected from normotensive mothers of uncomplicated pregnancies (control group) and 30 from mothers with hypertensive disorders of pregnancy (hypertensive group). Ethical clearance was taken from the Ethical Board of Rangpur Medical College. The placenta was selected from the obstetric ward of Gynecology and Obstetrics Department, Rangpur Medical College Hospital, Rangpur after taking written permission. All samples were collected from singleton live pregnancies of both normal vaginal and caesarian delivery. The birth weight was measured with baby weighing machine in kg. Gestational period was between 35-42 weeks and maternal age within 20 – 45 yrs range.

Inclusion criteria for Control Group:

Placentae delivered from mothers having normal blood pressure less than 140/90 mm of Hg.

Inclusion criteria for Hypertensive Group:

Placentae delivered from mothers having blood pressure 140/90 mm of Hg and above.

Common exclusion criteria:

1. Placentae delivered from mothers with Rh negative blood group, VDRL positive, HBsAg positive.
2. Presence of any other known systemic pathology
3. Multiple pregnancy (twining)
4. Congenital anomalies of the baby

The specimens were collected immediately after delivery, in the presence of researcher and were examined for completeness in recent state. Each specimen was gently washed in tap water on a dissection tray; the film of blood and blood clots on the maternal surface were removed with hand gently. The umbilical cord was cut 2 cm away from disc margin. The amniotic membrane was trimmed at disc margin with a scissors. Then the placenta was mopped and dried with dry cotton pad and blotting papers very gently. Measurement of weight of the placenta was done by means of digital electronic balance graduated in grams (gm) in a fresh state. Statistical test such as Student's's't` (unpaired) test, and correlation co-efficient test as applicable was done at 95% level of confidence ($p < 0.05$).

Results

The mean (±SD) of weight of placenta in hypertensive group and control group were 331.10±67.54 (gm) and 436.27±55.61 (gm) respectively. This data showed a highly significant decrease ($P<0.000$) in weight of placenta in hypertensive group when compared with weight of placenta in control group. (Figure 1)

Table-I: Placental weight, birth weight and feto-placental weight ratio in hypertensive and control group (n=30 in each group)

Variables	Groups		P value
	Hypertensive	Control	
Placental Weight (gm)	230 – 500 331.10±67.54	338 – 595 436.27±55.61	0.000(S)
Birth weight (kg)	1.20 – 3.30 2.24 ± .51	2.50 – 3.80 3.05 ± .05	0.000(S)
Feto-placental weight ratio	4.15 – 9.26 6.87±1.42	5.88 – 8.88 7.04±0.70	0.591 (NS)

Results are shown as ranges and mean±SDs
P values were reached from unpaired t test
S: significant at 95% confidence level
NS: non-significant at 95% confidence level

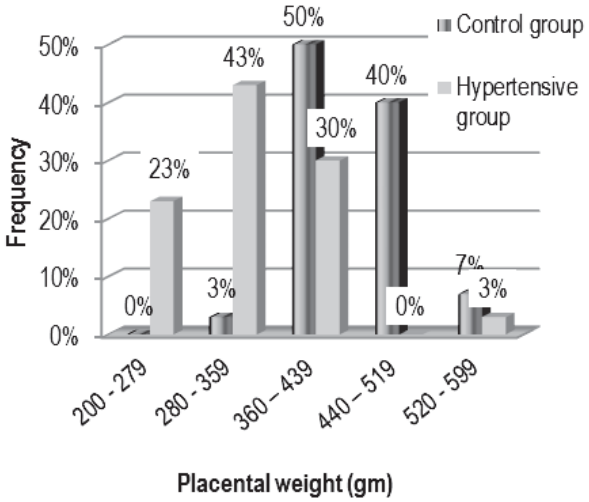

Figure-1: Distribution of placental weight in two groups.

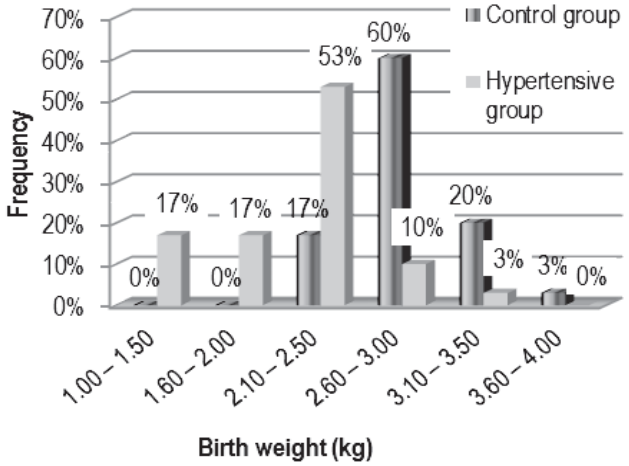

Figure-2: Distribution of birth weight in two groups.

The mean (±SD) birth weight in hypertensive group was 2.24±0.51 kg as compared to 3.05±0.35 kg in control group. Present study showed that there was a significant decrease in the birth weight in hypertensive group as compared to control group (P=0.000) (Table I, Figure 2).

In both the groups there was a significant positive correlation between placental weight and birth weight hypertensive group (r=0.503, P<0.01) and in control r=0.532, P<0.01) (Figure 3).

As per table I, on calculation; the mean (±SD) feto-placental weight ratio in hypertensive group was 6.87±1.42 and in control group 7.04±0.70. Though the difference in the mean feto-placental weight ratio was reduced in the hypertensive group, don't reach significant level (P >0.05).

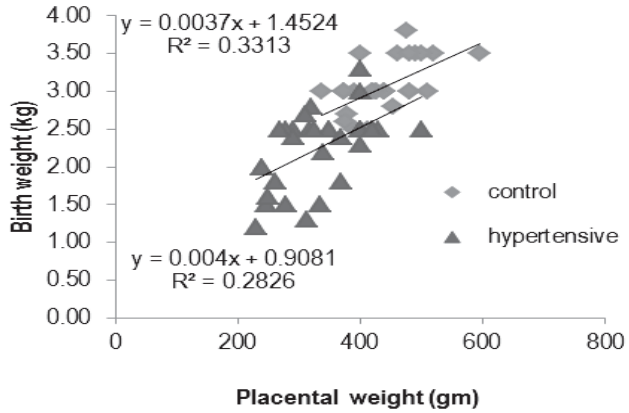

Figure-3: Correlation between placental weight and birth weight in two groups.

Discussion

Placental weight is a summary of different dimensions of growth, including placental thickness, shape, and number of blood vessels, cord insertion and arborisation of the villous and vascular nutrient exchange surface, reflected in increasing thickness of the disk. Although the placenta adapts well to the hypoxic condition in hypertension, the compensatory changes that occur are insufficient. These compensatory changes cause placental dysfunction that leads to oxidative stress and chronic fetal hypoxemia.[13] In the present study, mean placental weight in hypertensive group was 331.10±67.54 gm and in control group was 436.27±55.71 gm. It is clear that mean placental weight was significantly reduced in case of hypertensive group as compared to control group. The reduction in placental weight found in our study was analogous to the findings of previous workers.[1,14-21]

Hypertensive disorders not only affect maternal health but also jeopardize fetal growth and wellbeing.[15] The main impact of hypertension in pregnancy is under nutrition due to utero-placental vascular insufficiency which leads to growth restriction. In present study birth weight was significantly reduced in hypertensive group than control group. Birth weight was also found to be reduced by previous workers in pregnancies complicated with hypertension.[14-19, 21, 22] A significant positive correlation was found between placental weight and birth weight (p<0.001) in both control and hypertensive groups in the present study.

The linear relationship of placental weight and fetal weight can be very well showed by mean feto-placental ratio. The feto-placental weight ratio in our study was lower in hypertensive group as compared to control group; though the difference didn't reach the significant level.

Table II: Comparison of feto-placental weight ratio with other studies

SL	Study	Hypertensive Group	Control Group	Statistical significance
1.	Kaur etal 2013[15]	6.31±0.36	6.34±0.95	NS
2.	Nag et al 2013[18]	6.02 ± 0.36	5.94 ±0.86	(↑) S(P<0.05)
3.	Sankar et al 2013[13]	5.18±1.03	5.63±0.94	S (p<0.01)
4.	Anjankar et al 2014[14]	7.75±1.89	6.49±0.55	(↑) S(p<0.001)
5.	Singh et al 2014[21]	6.7±0.32	7.2±0.30	S (p<0.001)
6.	Keche et al 2015[17]	5.51	6.05	S (p<0.001)
7.	Thakur et al 2018[19]	6.70 ± 1.13	5.96 ±0.82	(↑) S(p<0.02)
8.	Our study	6.87±1.42	7.04±0.70	NS.

Results are shown as Mean + SDs and

P values were reached from unpaired t test

S: significant at 95% confidence level, NS: non-significant at 95% confidence level, (↑) S: significantly increased

Table II shows comparison of feto-placental weight ratio in our study with that of previous studies. Anjunkar et al (2014)14 found feto-placental weight ratio increased in hypertensive group and suggested that the placental weight is more severely affected than that of fetal weight. Placental weight and its ratio to birth weight have been reported to predict later chronic disease.[7] The majority of placental growth is completed by the end of second trimester but the fetal weight increases mostly in third trimester. If necessary steps are taken to control blood pressure in time we can improve placental growth therefore fetal outcome.

Conclusion

Considering the findings of the present study and correlating them with the findings of previous workers, it may be concluded that birth weight as well as the weight of placenta are reduced in hypertensive pregnancies. This study would help to create awareness and would be helpful in early recognition of fetus at risk and better management of such pregnancies.

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