

MORPHOLOGICAL STUDY OF PLACENTA IN SELECTED NORMOTENSIVE AND PRE-ECLAMPTIC WOMEN IN BANGLADESH

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Abstract:

Pre – Eclampsia is a disorder of 2nd half of pregnancy, which is characterized by a combination of hypertension, proteinuria and edema, secondary to decreased placental perfusion. Clinical studies suggest that there are morphological changes in the placenta of pre-eclamptic women, compared to normotensive pregnant women. In developing countries, pre-eclampsia causes an estimated 50,000 maternal deaths per year. Only a small number of studies have however, been conducted in Bangladesh.

Objective: *To compare the morphology of placenta in selected pre-eclamptic and normotensive pregnant women.*

Methods: *220 pregnant women were selected with inclusion and exclusion criteria from 3 different medical colleges and divided into 2 groups – A study group, consisting of 110 pre-eclamptic women and a control group consisting of 110 normotensive pregnant women. Dietary information was collected by 7 days food frequency questionnaire and food score was determined. Anthropometric and biochemical tests were performed. To measure the weight of the placentas, the decidua part of the placentas were removed. The umbilical cords were then cut, nearest to the placenta, to drain the blood from the placental vessels, and the weight was recorded upto nearest gram with weighing machine. The diameters of placentas were measured by taking the average of two maximum diameters of placentas with measuring tape (cm). The cotyledons were counted from maternal side after removal of decidua basalis. Number of placental infarcts were counted from fetal side.*

Results: *The mean weights, diameters, number of cotyledons were found to be significantly lower in the study group, compared to the control group. The number of infarcted areas was significantly higher in the placentas of pre-eclamptic women*

Conclusion: *Therefore, weight, diameter and number of cotyledons are decreased and number of infarcted areas are increased in the placenta of pre-eclamptic women, compared to normotensive pregnant women.*

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Introduction:

The placenta is a temporary structure unique to pregnancy function to sustain and protect the fetus until birth¹. It obtains its metabolic, immunological requirements and secretory functions to support fetal developments^{2,3}. The placenta is attached to the uterus, and the fetus is connected to the placenta via the umbilical cord⁴. The human placenta is hemomonochorial, meaning that only one chorionic cell

layer exists between maternal and fetal bloods⁵ thereby allowing nutrient uptake, waste elimination and gas exchange via the mother's blood supply⁶. The placenta clips to the wall of uterus, usually the top, side, front or back of the uterus and umbilical cord results from it. However, in rare cases, placenta might be found in the lower region of the uterus⁷. A term placenta is measures about 2.0 to 2.6 cm thick and 23 cm in diameter. A term placenta usually

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weighs approximately 470g to 508g with 500 ml of an average volume⁸.

Measurements of placenta differ broadly and substantially in distinct regions⁹. Studies exhibited fetal or maternal illnesses such as acute anaemia, hypertension, and in addition fetal hydrops effect fetal as well as placental weight^{10,11}. Race and socioeconomic position affects the placental weight¹². In Asia report of placental weight is 588g and 470g in Ukraine^{12,13}.

The shape of the placenta is extremely variable, probably due to placental location. It is thought to be influenced by its implanted position in the uterus, its interaction with the endometrium and uterine shape¹⁴. It usually shows an ovoid shape with a 16-20 cm diameter and a 2-3 cm thickness and it grows exponentially during gestation, from an average of 6 gm at 3 week of gestation to 470 gm at term¹⁵. The placenta implants anywhere in the uterus, but most commonly, it is in an anterior or posterior location, much less often it is on the fundus¹⁶.

One of the prominent innovations in early mammalian embryogenesis is the formation of the placenta. By 21 days after fertilization the trophoblasts have begun to sort themselves out into what will become the tree-like structures that make up the placenta¹⁷.

The trophoblast cells are a major component in the placenta¹⁸ and are fetal epithelial cells that form an interface between mother and offspring¹⁹. In human, the trophoblast cells are tumor-like in their aspect of invasion. However, their invasiveness is precisely controlled in a way that spatially the cells stop penetration at the inner third of the myometrium, and temporarily, the invasion occurs only at the early stage of pregnancy²⁰. The human trophoblast differentiates along two pathways^{21,22}:

- The Villous trophoblast pathway including the cytotrophoblastic cells differentiates by fusion to form the syncytiotrophoblast that covers the entire surface of the villi.
- The extravillous trophoblast pathway.

The finger-like chorionic villi are the main functional units of the placenta¹⁷ mediating nutrient absorption, waste elimination and generating the bulk of the hormones produced by the placenta during pregnancy³.

Materials and Method

A comparative cross sectional study was done for three years from June 2015 to May 2018. Study groups were selected from three major tertiary hospitals located in Dhaka City: Dhaka Medical College and Hospital, Sir Salimullah Medical College and Mitford Hospital and Holy Family Red Crescent Medical College and Hospital. To calculate the prevalence and proportion of pre-eclampsia, we followed the standard procedure. A total number of 10,800 pregnant patients, admitted in Gynae and Obs Department of aforesaid hospitals from June, 2015 to May, 18 were selected. Amongst them, a total of 1800 were complicated with pre-eclampsia. So, Sample size was calculated, n=217. Selection of cases was based on strict inclusion and exclusion criteria: In case of pre-eclamptic women age groups: 18 to 40 years, Pregnancy status: third trimester of pregnancy, Blood Pressure: Diastolic Blood Pressure above 90 mm of Hg. Clinically oedema of legs present; Proteinuria: Confirmed by biochemical tests. Exclusion Criteria: Less than 18, greater than 40; No oedema; No preteinuria; Normal Blood Pressure (diastolic < 90 mm of Hg). A questionnaire was developed to obtain relevant information regarding socio economic status, age, obstetric history, monthly income, living area, family size, education, type of jobs and usual habit of food before admission to hospital. Ethical permission has been obtained from Ethical review committee of Bangladesh Medical and Research Council (B.M.R.C). Written consent was taken from both pre-eclamptic and normal pregnant women. To measure the weight of the placentas, the decidual part of the placentas were removed. The umbilical cords were then cut, nearest to the placenta, to drain the blood from the placental vessels, and the weight was recorded upto nearest gram with weighing machine. The diameters of placentas were measured by taking the average of two maximum diameters of placentas with measuring tape (cm). The cotyledons were

counted from maternal side after removal of deciduas basalis. Number of placental infarcts were counted from fetal side. Haematological and BioChemical Assays: CBC, HB%, ESR and Fasting Blood Sugar, serum Vit C and serum Vit E, Urine for Albumin: assessed by Heat Coagulation Test were measured. Nutritional Status: measured by Mid Upper Arm Circumference(MUAC), using a measuring tape (in cm). Dietary Information: Dietary information was measured by 7 days food frequency questionnaire. Measurement of

weight: Body weight was measured by bathroom scale, to the nearest 0.5 kg. Measurement of height: A wooden height scale was used to record height with bared heels, standing in upright position, height was measured to nearest 0.1 cm. Blood Pressure Measurement: The blood pressure was measured by sphygmomanometer machine and stethoscope. Birth weights of new born babies: Birth weights of new born babies were recorded to the nearest 20 grams after delivery without clothes on a beam balance (Dedecto medic, Delecto scale inc., U.S.A.)

Results:

Table-I

Distribution of respondents according to Hospital

Hospitals	Pre-eclamptic Women (Study Group A) N=110		Normal Pregnancy (Control Group - B) N = 110	
DMCH	70	63.64%	70	63.64%
Mitfor	30	27.27%	30	27.27%
HFRCMH	10	9.09%	10	9.09%
Total	110	100%	110	100%

Table I: shows 63% respondents were from DMCH, 27% from Mitford, and 9% from HFRCH

Table-II

Anthropometric and clinical indices

N=220	Pre - Eclamptic (Group - A) n= 110 (Mean ± STD.)	Normal Pregnant Women (Control - B) n = 110 (Mean ± STD.)	P. Value
Weight (Kg.) of the Patient	66.65±5.34	66.9±2.05	0.65
Height (cm.) of the Patient	154.06±3.58	156.003±3.36	0.62
MUAC (CM)	23.5±2.64	25.1.1±2.24	0.001
Systolic Blood Pressure (mm/Hg)	125.14±28.34	117.27±4.47	0.001
Diastolic Blood Pressure (mm/Hg)	98±5.55	79±3.51	0.001
Wt. of Babies (Kg.)	2.09 ± 0.13	2.80 ± 0.12	0.001

Table II, shows mean MUAC ,systolic and diastolic BP, wt of new born Babies of Study and Control Group were different , it was statistically, significant.

Table-III

Placental Weight (gm) of pre-eclamptic and normal pregnant women

	Pre eclamptic Women (Group-A) N=110 (Mean±SD)	Normal Pregnant Women Control (Group - B) N=110 (Mean±SD)	P. Value
Wt. of Placenta (gm.)	404.80±4.04	486.96±1.62	0.001

Table -III shows that mean placental weight of pre-eclamptic women (404.80 ± 4.04) was significantly lower than the mean placental weight of normal pregnancy women (486.96 ± 1.62).

Table-IV*Diameter (cm) of Placenta of pre-eclamptic and normal pregnant women*

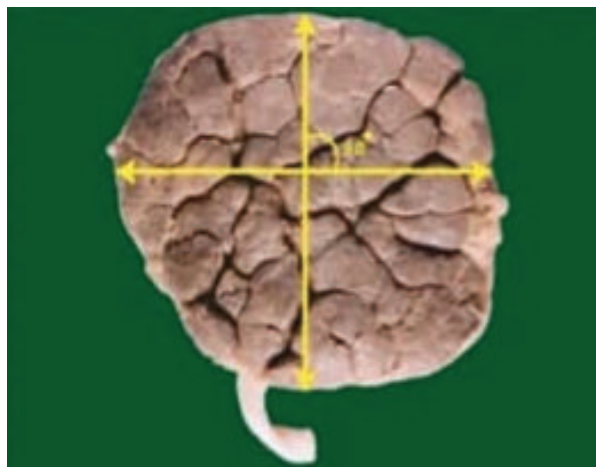
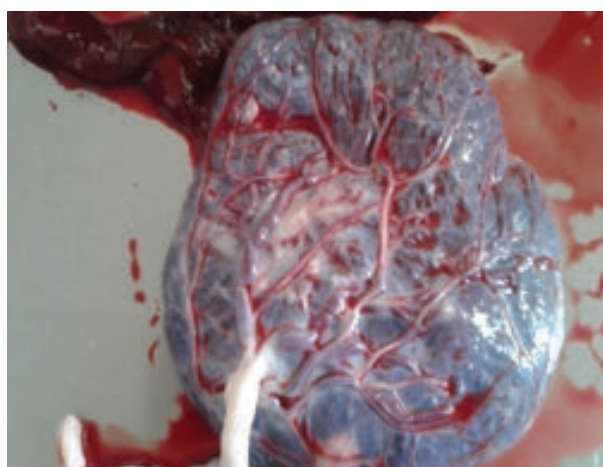
	Pre eclamptic Women (Group-AN=110) (Mean \pm SD)	Normal Pregnant Women Control Group – BN=110 (Mean \pm SD)	P. Value
Placenta Diameter (cm.)	15.88 \pm 0.13	18.22 \pm 0.79	0.001

Table-IV shows that mean placenta diameter of pre-eclamptic women (15.88 \pm 0.13) was significantly (p-value .001) lower than the mean placental diameter of normal pregnancy women (18.22 \pm 0.79).

Table -V*Number of Cotyledons of of pre-eclamptic and normal pregnant women*

	Pre eclamptic Women (Group - A) N=110 (Mean \pm SD)	Normal Pregnant Women Control (Group – B) N=110 (Mean \pm SD)	P. Value
No of Cotyledon (Nos.)	16 \pm 0.78	17.10 \pm 0.89	0.002

Table 5 shows that mean no. of cotyledon (Nos.) of pre-eclamptic women (16 \pm 0.78) was significantly lower than the mean no. of cotyledon (Nos.) of normal pregnant women (17.10 \pm 0.89).

**Table-VI***Number of Infarcted Areas of pre-eclamptic and normal pregnant women*

	Pre eclamptic Women (Group-A) N=110 (Mean \pm SD)	Normal Pregnant Women Control (Group – B) N=110 (Mean \pm SD)	P. Value
No. of Infarcted Area in Placenta	16.02 \pm 0.80	4.02 \pm 0.80	0.001

Table 6 shows that mean no. of infarcted area in placenta of pre-eclamptic women (16.02 ± 0.80) was significantly (p -value .001) higher than the mean no. of infarcted area in placenta of normal pregnancy women (4.02 ± 0.80).



Discussion:

This study indicates that mean placental weight in pre-eclamptic women was less (404.80 gm) compared to normal pregnant women (486.96 gm). A study was conducted by Shah et al²³, 1985; and others (Cibil LA²⁴, Teasdale²⁵, Barua R²⁶, and Begum²⁷), they also observed reduced placental weight (390.82 gm) in Pre-eclamptic women in compared to normal pregnant women (496.56 gm). A study was conducted by Segupta Kishwara, Abu Sadat, Shamim Ara²⁸ and others, Department of Anatomy, Dhaka Medical College, 2010. They observed lower placental weight in pre-eclampsia compare to normal pregnancy. Many foreign studies have shown the effect of Hypertensive disorders of pregnancy on the placental weight and the overall status of the mother and the baby, they reported the moderate to severe reduction of placental weight in pre-eclampsia and eclampsia²⁹. Cibils²⁴ studied pregnancy outcome, he commented that the placenta from hypertensive patients were significantly smaller than the normal, suggesting that the pathologic process interferes with the normal placental growth. Shah et al²³ found that mean weight of decreases with

increasing severity of toxemia. Teasdale³⁰ observed a reduction of placental weight in pre-eclampsia. Sodhi et al³¹ observed a lower placental weight in pre-eclampsia. Barua²⁶ observed that placental weight was significantly lower in the eclamptic group than in the control group. Begum²⁷ found that mean placental weight was lower in pregnancy induced hypertension group than that of the control group. It was observed that there was significant reduction of placental weight in maternal pre-eclampsia and conforms to the reports of Cibils²⁴, Shah et al²³, Teasdale²⁵, Sodhi et al³¹, Barua²⁶, and Begum²⁷. Soma et al,²⁹ also stated that it must be assumed that morphological and histological findings in hypertensive placenta are due to occlusion or narrowing of the uteroplacental vasculature as well as placental ischemia. Placental infarction was more in case of pre-eclamptic women compared to normal normotensive pregnant women³². It was also observed by Mirchandani et al³³ and Masodkar et al³⁴. It was observed that the mean diameter of placenta (15.88 cm), the number of cotyledons (16) was less and the number of infarcted areas was increased (16.02) in case of pre-eclamptic women compared to normal pregnant women were (18.22 cm), (17) and (4.02) respectively. Segupta kishwara et al., (2010); and several others (Abu Sadat Mohammad Nurunnabi, Mahamuda Begum, Abu Rayhan, Shamim Ara)²⁶ observed that the mean diameter of placenta, ($16.08 + 2.08$ cm), mean number of cotyledons were ($14.30 + 2.47$) was less in the study group, compared to the control group ($18.80 + 2.32$ cm) and ($15.77 + 2.80$) respectively. They also observed increased number of infarcted areas, 15, in the placenta of study group, compared to the control group, which were only 4.

Conclusion:

This was a comparative study to evaluate the morphological changes of placenta in pre-eclamptic women. Our study revealed that the mean weights, diameters, number of cotyledons were significantly lower in the study group, compared to the control group. The number of infarcted areas was significantly higher in the placentas of pre-eclamptic women

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