

GROSS MORPHOLOGICAL STUDY OF PLACENTA IN PREECLAMPSIA

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ABSTRACT

Placenta is a fetomaternal organ that structurally and functionally connects the developing fetus to the uterine wall during pregnancy. Pregnancy is usually complicated by preeclampsia, which in turn will alter the macroarchitecture and functions of the placenta as well as health of the pregnant mothers. Hence, this study was conducted to assess the macroarchitectural changes of placenta in preeclampsia mothers as compared to normotensive mothers. A cross-sectional study was carried out on preeclampsia mothers who gave birth at Gandhi Memorial and Black Lion Specialized Hospitals, Addis Ababa, Ethiopia. A total of 100 fresh placentas from normotensive and preeclampsia mothers were implemented. The macroarchitecture of placenta were examined by inspection and measuring. The data were analyzed by independent- samples t-test and chi square. Accordingly, the finding showed that the shape of placentas was circular in 80% of normotensive and 72% of preeclamptic. Placental weight, diameter, thickness and number of cotyledon in preeclamptic mothers were 456.2 gram, 17.66 centimeter, 1.72 centimeter and 17.24; in normotensive 499.4 gram, 19.4centimeter, 1.96 centimeter, and 18.66 respectively. According to the present study most of macroarchitecture (diameter, thickness, weight and number of cotyledon) of placenta were significantly decreased in preeclamptic mothers.

Key words: placenta, weight, diameter, cotyledon, preeclampsia.

INTRODUCTION

Placenta is a fetomaternal organ that maintains pregnancy and promotes fetal development. It structurally and functionally connects the developing fetus to the uterine wall (Wang, 2010). It develops from chorion frondosum and decidua basalis. Placenta begins to meet the demand of the embryo as early as the third week of intrauterine life (Huppertz, 2008). It has maternal and fetal surfaces (Ashfaq, Janjua, and Channa, 2005). A term placenta is dark reddish-blue and discoid organ, 15- 25 cm in diameter, 400- 600 gm in weight, 2- 3 cm in thickness and 15 – 20 cotyledons (Yetter, 1998). When pregnancy is complicated by preeclampsia, its

morphophysiology will be altered, which in turn will impact maternal health as well as the fetus (Rahman et al., 2006). Preeclampsia is pregnancy-specific syndrome which usually occurs after 20 weeks of gestation (or earlier with trophoblastic diseases). It is characterized by increased blood pressure $\geq 140/90$ mmHg and proteinuria (≥ 300 mg/24hr or $\geq +1$ dipstick) in a women normotensive before 20 week (Berks et al., 2013). This study, therefore, aimed to assess the presence of any macroarchitectural changes of placenta in preeclamptic mothers in comparison with normotensive in two hospitals in Addis Ababa.

MATERIALS AND METHODS

After getting an ethical clearance from department of Anatomy, School of Medicine, College of Health Science, Addis Ababa University, a cross sectional study was carried out at Gandhi Memorial and Black Lion Specialized Hospitals, Addis Ababa, Ethiopia. A total of 100 fresh placentas from preeclampsia and normotensive mothers in equal share were implemented. The samples were selected by simple random sampling technique by coming order for delivery. Mothers who had gestational age of 37 – 42 weeks were included in the study. In the placenta processing membrane were trimmed, umbilical cord was cut 2 centimeters away from insertion and washed by normal saline. Then the following placenta parameters were determined. Shape: by inspection it was categorized as circular, oval and irregular. Diameter: after putting the placenta on fetal surface on flat tray the first maximum diameter was measured by non-stretched scale graduated in centimeters, then a second maximum diameter was measured perpendicular to the first. Average of the two was taken as the diameter (Nordenvall, Sandstedt, and Ulmsten, 1998).

Thickness: With a long needle, placental thickness was measured at five points. The placenta maternal surface was divided arbitrarily into three equal zones by drawing two circles on the maternal surface. One thickness was measured from the centre of the central zone, two from middle and two from peripheral zone. The peripheral points were taken within the outer zone on a line perpendicular to the previous imaginary line. Finally, the mean of all five measurements was in centimeters considered as thickness of placenta (Anwar, 1999).

Weight: weight of each placenta was recorded in grams by using a weighing machine scale with grams. After determining the above parameters each placenta was fixed by formalin for 24 hours. Then cotyledons were counted in a loop fashion from one end to the other (Kishwara et al., 2009).

The collected data was coded and entered into EPI INFO version 16 then data was exported to SPSS version 20. The data was analyzed using independent sample t-test and chi-square test. Differences $p < 0.05$ was considered statistically significant.

RESULTS

This study finding showed that the mean age of participants was 26.46 ± 2.95 year in normotensive and 25.56 ± 2.84 year in preeclamptic mothers.

Most of preeclamptic and normotensive mothers were Para 0 and Para 1 respectively.

Table 1: - Age categories among normotensive and preeclamptic mothers

Age (year)	UC (%)	PE (%)
20-24	26	38
25-29	60	48
30-34	14	14

Table 2: - Parity distribution in normotensive and preeclamptic mothers

Parity	UC (%)	PE (%)
Para-0	30	58
Para-1	44	22
Para-2	22	18
Para \geq 3	4	2

From all participants 28 % of preeclamptic and 4 % of normotensive mothers were delivered by C/S. In preeclamptic mothers 72 % circular, 10 % oval and 8% irregular shape of placenta was observed. In normotensive mothers 80 % circular, 14 % oval and 4 % irregular shapes were observed. Placental weight was

significantly ($p < 0.00001$) decreased in preeclamptic (456.20 ± 19.13 gram) than normotensive (499.4 ± 11.89 gram) mothers. Placental diameter and thickness in preeclamptic mothers were 17.66 ± 1.07 centimeter and 1.72 ± 0.11 centimeter respectively.

Table 3: Gross morphological characteristics of placental in normotensive and preeclamptic mothers

Placenta parameter	normotensive (mean \pm SD)	PE (mean \pm SD)	P value
Weight (gm)	499.4 \pm 11.89	456.20 \pm 19.13	0.00001
Cotyledon	18.66 \pm 1.21	17.24 \pm 1.06	0.001
Diameter (cm)	19.40 \pm 0.85	17.66 \pm 1.07	0.0001
Thickness (cm)	1.96 \pm 0.20	1.72 \pm 0.11	0.0001

DISCUSSION

Placenta of preeclamptic mothers shows macroarchitectural maldevelopment (Mandhana et al., 2014). The weight of placenta is functionally a significant parameter as it relates to villous area and fetal metabolism (Shevade et al., 2015). This study finding showed that the mean placental weight in preeclampsia group was 456.20 ± 19.13 gm and 499.4 ± 11.89 gm in normotensive mothers. Placental weight was significantly ($p < 0.00001$) decreased in preeclamptic mothers as compared to normotensive mothers. This was consistent with reports from other studies (Udania, and Jain, 2001; Vijayalakshmi, and Kittali, 2015; Singh, and Gugapriya, 2014; Shevade et al., 2015). But

the above reported results showed that placental weight in preeclamptic were more decreased as compared to the present study, which might be attributed to severe placental insufficiency caused by earlier onset of preeclampsia and low health quality service given for mothers during follow up in preeclamptic cases included in the above studies. In addition, this may be due to environmental and genetic differences.

According to the present study placental number of cotyledon was 17.24 ± 1.06 in preeclamptic and 18.66 ± 1.21 in normotensive mothers. Number of cotyledons of placenta was significantly ($p < 0.001$) decreased in

preeclamptic mothers as compared to normotensive mothers. This study was in line with other studies (Vijayalakshmi, and Kittali, 2015; Singh, and Gugapriya, 2014; Shevade et al., 2015). Number of cotyledons of placenta in preeclamptic mothers in the above studies was more decreased as compared to the present study. This may be due to early onset of preeclampsia and/or a poor control of preeclampsia result much degeneration of placental cotyledon.

The present finding showed that placental diameter was 19.40 ± 0.85 centimeter in normotensive versus 17.66 ± 1.07 centimeter in preeclampsia and placental thickness was 1.96 ± 0.20 centimeter (normotensive) versus 1.72 ± 0.11 centimeter (preeclampsia). Placental diameter and thickness in preeclampsia were significantly ($p < 0.0001$) smaller and thinner respectively. This study was in line with the study done by (Singh, and Gugapriya, 2014; Shevade et al., 2015). But a study done by Durgesh et al. (2015) showed that there was no significant change of placental thickness and diameter in preeclampsia and normotensive mothers which contrast with the present study. This difference may be due to preeclamptic mothers included in Durgesh et al. study were late onset preeclampsia cases and/or get better health service during pregnancy as compared to preeclamptic mothers included in the present study.

According to this study most of the placentas 80% in normotensive and 72% in preeclampsia

were circular in shape. In addition, 14% versus 20% oval and 6% versus 8% irregular placental shapes were observed in normotensive and preeclamptic mothers respectively. These findings though it is not statistically significant, there was more oval and irregular placental shape observed in preeclampsia. This difference may be due to apoptosis and compensatory hyperplasia of the parenchyma run side by side causing loss and fibrosis of parenchyma tissue. These changes influence the shapes which deviate from normal. The present study was in line with a study conducted by Navbir (2012). But according to other studies (Sudha, Sivakumar, and Christilda, 2012; Vijayalakshmi and Kittali, 2015) there was more altered shape in preeclampsia; the difference was statistically significant. This difference may be due to a low-quality health service given and/or early onset of preeclampsia in the above two study cases.

In conclusion placental weight, diameter, thickness and number of cotyledon were significantly decreased in preeclamptic mothers as compared to normotensive. Even though, it was not significant more irregular shape of placenta were observed in preeclamptic mothers.

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