

Research Article

Study of Number of Cotyledons of Placenta in Different Gestational Age Groups of Healthy Pregnant Mother of Bangladesh

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Abstract

Introduction: The placenta has drawn attention as an important indicator of intrauterine condition of fetus and maternal diseases. The study of number of cotyledons of placenta in different gestational age groups of healthy pregnant mother of Bangladesh is cross sectional descriptive study. **Aim of the study:** The aim of the study was to study the variation of number of cotyledons of placenta in different state of gestational ages of healthy pregnant mother. **Methods:** This cross sectional descriptive study was conducted in the Department of Anatomy, Mymensingh Medical College, Mymensingh, from January 2018 to December 2018. This study was performed on 80 human placentae. **Result:** The mean (\pm SD) number of cotyledon of the placenta was 18.56 (\pm 2.15) in group A, 21.21 (\pm 3.11) in group B and 23.75 (\pm 3.45) in group C. The mean number of cotyledon of the placenta was maximum in group C (23.75) and was minimum in group A (18.56). It was also observed that the mean number of cotyledon of the placenta increased with gestational age. The mean difference of the number of placental cotyledons between groups A and C was statistically moderately significant ($p < 0.05$) but between A and B and B and C was statistically non-significant ($p > 0.05$). **Conclusion:** The placental examination becomes important as it will help in understanding the specific etiologies of adverse outcome. This study has shown that the mean number of cotyledon of the placenta increased with gestational age.

Keywords

Placenta, Cotyledons, Gestational Age, Healthy Pregnant Mother

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The placenta in Latin means cake that is floppy mass. Placenta is a vital organ for fetal development, derived from both fetal and maternal tissue, the maternal portion being the decidua basalis and fetal portion is chorion-fracosum [1]. Placenta is a mirror which reflects intrauterine status of the fetus [2]. Placenta is said to be a diary of intrauterine life [3]. Only eutherian mammals possess placenta. The human placenta is discoid, because of its shape; haemochorial, because of direct contact of the chorion with the maternal blood and decidua, because some maternal tissue is shed at parturition. The placenta is attached to the uterine wall and establishes connection between the mother and fetus through the umbilical cord. The fact that maternal and fetal tissues come in direct contact without rejection suggest immunological acceptance of the fetal graft by the mother. The placenta at term is almost a circular disc with a diameter of 15-20 cm and thickness of about 3 cm at its center. It presents two surfaces, fetal and maternal, and peripheral margin. The fetal surface is covered by the smooth and glistening amnion with the umbilical cord attached at or near its center. At term, about four-fifths of the placenta is of fetal origin. The maternal surface is rough and spongy. The maternal surface is mapped out into 15-20 somewhat convex polygonal areas known as lobes or cotyledons which are limited by fissures. Each fissure is occupied by the decidual septum which is derived from basal plate [4]. At approximately 40 days after conception; the trophoblast has invaded approximately 40-60 spiral arteries, of which 12-15 may be called major arteries. The pulsatile arterial pressure of blood that spurts from each of these major vessels pushes the chorionic plate away from the decidua to form 12-15 "tents" or maternal cotyledons. The remaining 24-45 tapped arterioles form minor vascular units that become crowded between the larger units. As the chorionic plate is pushed away from the basal plate, the anchoring villi pull the maternal basal plate up into septa (columns of fibrous tissue that virtually surround the major cotyledons). Thus at the center of each maternal vascular unit there is 1 artery that terminates in a thin walled sac, but there are numerous maternal veins that open through the basal plate at random. The human placenta has no peripheral venous collecting system. Within each maternal vascular unit is the fetal vascular "tree" with the tertiary free-floating villi (the major area for physiologic exchange) acting as thousands of baffles that disperse the maternal bloodstream in many directions [5]. In normal pregnancies, the wall of the spiral arteries is invaded by trophoblastic cells and transformed into large, tortuous channels that carry a large amount of blood to the intervillous space and are resistant to the effects of vasomotor agents. Trophoblastic invasion begins from 16-20 weeks of gestation causing destruction of the muscularis layer of spiral arteries and is completed by 24 weeks' time. These physiologic changes are restricted in patients with preeclampsia [6]. The maternal cotyledons, or lobes, of the placenta are on the maternal side of the surface [7]. Each cotyledon is a perfusion

1. Introduction

chamber partly or wholly separated from adjacent chambers by a wall of connective tissue, which may be lined by trophoblast cells. One or more maternal spiral arteries jet blood into the chamber. The fetal cotyledons comprise one or more fetal villous trees, containing a fetal artery and a vein, that are suspended into the maternal cotyledon. The number of maternal cotyledons in the placenta is highly variable. What determines the number is unknown, though it may depend on events in early gestation [8].

2. Objective

The objective of this study is to derive indices describing the relationship of the number of cotyledons of placenta with advancing gestational age. We also aim to compare these indices with national and international parameter.

3. Methodology & Materials

This cross sectional descriptive study was performed on 80 human placentae. This study was conducted in the Department of Anatomy, Mymensingh Medical College, Mymensingh, from January 2018 to December 2018. The specimens were collected from the Department of Gynaecology and Obstetrics, Mymensingh Medical College Hospital (MMCH), by purposive sampling technique. These specimens were collected of gestational age at 28 weeks and above from healthy pregnant mother excluding the following criteria- below 28 weeks of gestation, antepartum haemorrhage, multiple pregnancies, pre-eclamptic toxemia, eclampsia, Rh-incompatibility, retained placenta, diabetes mellitus and pregnancy induced hypertension. It was performed on 80 human placentas to find out the variation in number of cotyledons of placenta of healthy Bangladeshi mother in relation to different gestational age. All patients' information regarding the exclusion criteria were collected from the hospital records of MMCH. Just after delivery of the placenta and umbilical cord, they were kept in a bucket containing 10% formol saline. After dissecting the umbilical cord, each placenta was allotted an identification number tagged with a piece of waxed cloth. The collected specimens were divided into 3 groups e.g. A, B, and C according to the gestational age, on the basis of maturation of baby such as group A pre-term 28-36 weeks, group B term 37-40 weeks, group C late term above 40 weeks (Table 1) for convenience of differentiating the variation of number of cotyledons of placenta at different gestational age. Each formalin fixed placenta was taken on both hands. Then gentle pressure was applied on the fetal surface. As a result, the cotyledons (Figure 1) on the maternal aspect become prominent. Then counting was started from the right upper end of the placenta going leftward and again turning to the right in a manner of loop. This counting procedure was repeated until the left lower end of the pla-

centa was reached. The total number of cotyledons was recorded (Figure 2) [9]. The number of cotyledons of placenta was recorded in the pre designed data sheet, analyzed by SPSS program.

Table 1. Gestational Age Grouping of Samples for Morphological Study (n=80).

Group	Gestational Age in week	Number of specimen
A	28 – 36	20
B	37 – 40	42
C	Above 40 weeks	18
Total		80

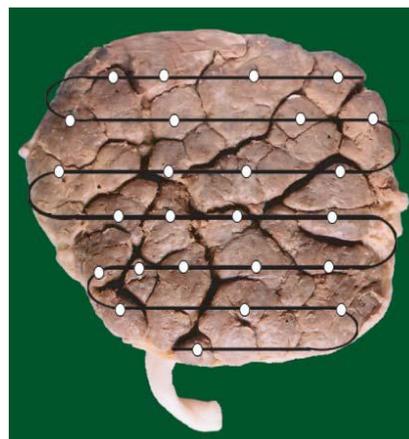


Figure 2. Photograph of Showing the Procedure of Counting of Number of Cotyledons of Placenta.

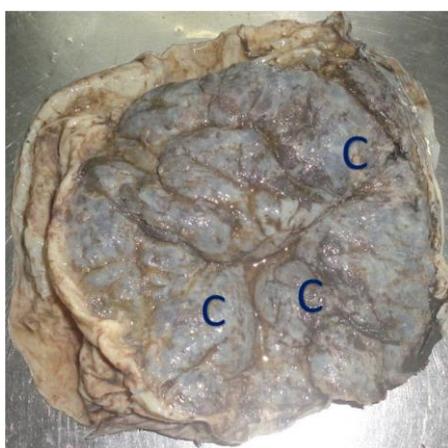


Figure 1. Photograph of the Cotyledons (C) of Placenta.

4. Result

The maximum number of cotyledon of the placenta was 24 in Group A, 29 in group B, 30 in Group C. The minimum number of cotyledon of the placenta was 16 in Group A, 17 in Group B and 17 in Group C. The mean (\pm SD) number of cotyledon of the placenta was 18.56 (\pm 2.15) in group A, 21.21 (\pm 3.11) in group B and 23.75 (\pm 3.45) in group C. The mean number of cotyledon of the placenta was maximum in group C (23.75) and was minimum in group A (18.56). It was also observed that the mean number of cotyledon of the placenta increased with gestational age. The mean difference of the number of placental cotyledons between groups A and C was statistically moderately significant ($p < 0.05$) but between A and B and B and C was statistically non-significant ($p > 0.05$). Above findings are shown in the table 2, table 3 and figure 3.

Table 2. Number of Cotyledons of Placenta in Different Gestational Age Groups.

Gestational Age Group	Number of Specimen (n = 80)	Number of Cotyledons Mean \pm SD (Minimum – Maximum)
A (28 to 36 weeks)	18	18.56 \pm 2.15 (16 – 24)
B (37 to 40 weeks)	42	21.21 \pm 3.11 (17 – 29)
C (Above 40 weeks)	20	23.75 \pm 3.45 (17 – 30)

Table 3. Comparison of number of cotyledons of placenta among the gestational age groups.

Comparison between gestational age groups	Mean Difference	Standard Error of Difference	t	p	Level of significance
A & B	-2.65873	0.69781	-2.01	0.05	Non-significant
B & C	-2.53571	0.90811	-0.429	0.67	Non-significant
A & C	5.19444	0.92219	3.325	0.002	Moderately significant

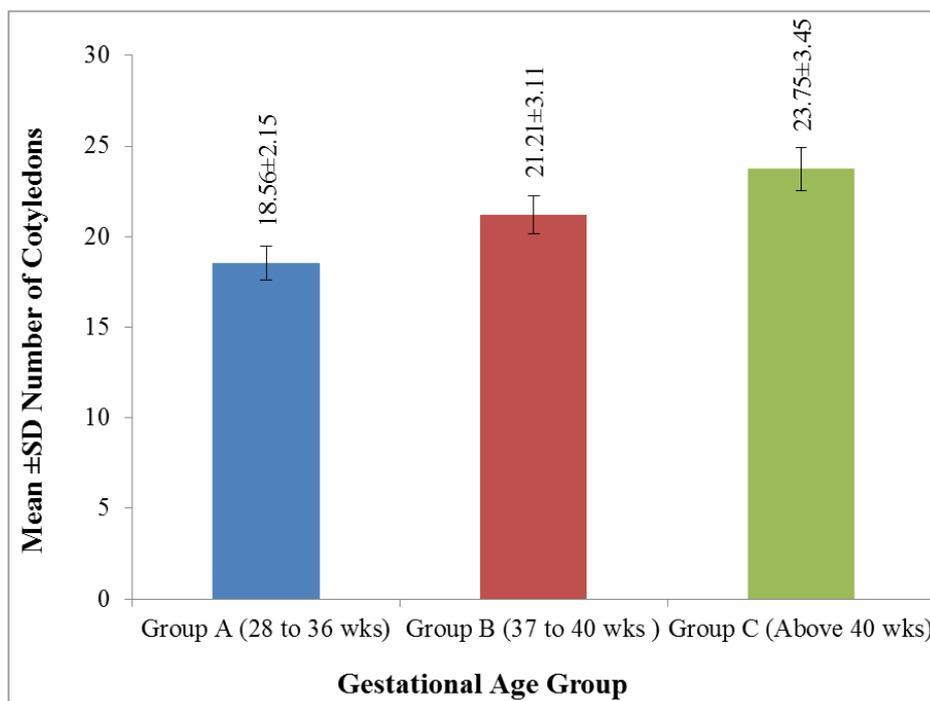


Figure 3. Bar Diagram Showing the Number of Cotyledons of Placenta in Different Gestational Age Groups.

5. Discussion

The maximum number of cotyledons of the placenta was 24 in Group A, 29 in group B, 30 in group C. The minimum number of cotyledons of the placenta was 16 in group A, 17 in group B and 17 in group C. The mean (\pm SD) number of cotyledons of the placenta was 18.56 (\pm 2.15) in group A, 21.21 (\pm 3.11) in group B and 23.75 (\pm 3.45) in group C. The mean number of cotyledons of the placenta was maximum in group C (23.75) and was minimum in group A (18.56). It was also observed that the mean number of cotyledons of the placenta increased with age. The mean difference of the placental cotyledons between groups A and C was statistically moderately significant ($p < 0.05$) but A and B, B and C was statistically non-significant ($p > 0.05$).

Gunasegaran (2017) described that the average number of cotyledons of placenta at term was 15 – 20 [10]. Sadler (2015) elaborated that the number of cotyledons of placenta at term was about 15 to 20 [11]. Datta (2012) elaborated that the maternal surface of placenta was rough and irregular and was mapped into 15 to 30 polygonal areas known as the cotyledons which are limited by fissures [12]. Dutta (2011) stated that the average number of cotyledons of the placenta at term was about 15 to 29 [4]. Raghunath, Vijayalakshmi & Shenoy (2011) showed the average number of cotyledons was 18 and that study revealed a paucity of cotyledons in cases of pregnancy induced hypertension, low birth weight and prematurity [13]. Begum (2010) made a study on 60 human placentas and revealed that the mean numbers of cotyledons of placenta were calculated as 16.90 in between 28 to 32 weeks, 19.31 in be-

tween 33 to 37 weeks and 20.24 in between 38 to above weeks of gestation [14]. Kishwara (2009) stated that the mean \pm SD number of cotyledon in group A (n = 30, normal pregnant women) and group B (n = 30, pregnancy complicated by pre-eclampsia) was 15.77 \pm 2.80 and 14.30 \pm 2.47 respectively. Statistical analysis between group A and B was significant at $P < 0.05$ [9]. Majumder (2007) made a study on placenta of normal and hypertensive pregnancies and found that the mean \pm SD number of cotyledons per placenta in case of control group was 17 \pm 2 and hypertensive group was 16 \pm 2 [15]. Sultana (2005) performed a study on 45 placentas (20 control group and 25 eclamptic mothers) and found the mean \pm SD number of cotyledons of placenta in eclampsia was 15.5 \pm 1.75 ranged 14 to 25. Whereas in control group the number of cotyledons of placenta ranged from 12 to 18 with a mean \pm SD number of cotyledons was 14.24 \pm 1.66 [16]. Dawn (2004) stated that the maternal surface showed dull red 15-20 lobes or maternal cotyledons which were separated by sulci. Each sulcus corresponds to decidual septum [17]. Sing (2014) mention that the number of lobes generally varied from 15 to 20 [18]. Kaufmann (1985) showed that the surface of the basal plate was incised by the placenta septa, which form deep clefts that subdivide the basal plate into 10–30 regions called maternal lobes or cotyledons. Histologically each maternal lobe was occupied by one to four fetal lobules [19]. Boyd & Hamilton (1970) viewed that the number of slightly elevated convex areas called lobes (or if small, lobules) varied from 10 to 38. These lobes are separated, albeit incompletely, by grooves of variable depth, the placental septa. The lobes are also referred to as cotyledons [20].

Findings of the present study in all group was more or less

similar to the findings of above mentioned authors.

6. Limitations of the Study

The study was conducted in a single hospital with a small sample size. So, the results may not represent the whole community.

7. Conclusion

The careful attention to sample collection, storage and processing are critical in order to reduce the number of variable that can influence data derived from the human placenta. This study considered the important factors that we have experienced during the course of our research. The placental examination becomes important as it will help in understanding the specific etiologies of adverse outcome. This study has shown that the mean number of cotyledon of the placenta increased with gestational age.

Abbreviations

MMCH Mymensingh Medical College Hospital

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Author Contributions

Sanjib Kumar Bose: Conceptualization, Data curation, Methodology, Writing – original draft, Review & editing

Labiba Jabeen: Data curation, Investigation, Visualization

Rafuja Afrin Shanto: Investigation, Software, Resources

Afsana Khanam: Supervision, Validation, Visualization

Rawshon Ara Naznin: Funding acquisition, Project administration, Formal Analysis

Sharmin Akter Sumi: Project administration, Validation, Review & editing

Ethical Approval

The study was approved by the Institutional Ethics Committee.

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Conflicts of Interest

The authors declare no conflicts of interest.

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