Prevalence of Placental Pathology in Low Birthweight Infants

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Objective: *To determine the prevalence of placental pathology among low birthweight infants delivered at Srinagarind Hospital.*
Material and Method: *Descriptive study of 114 placentas from infants weighing between 500 and 2,499 grams delivered between June 2002 and June 2004 in the labour room, Srinagarind Hospital. Placentas from low birthweight infants were examined by a perinatal pathologist in the surgical pathology room, department of pathology, faculty of medicine, Khon Kaen University. The demographic data of the mothers, the gestational age of the infants by obstetric information and according to the Ballard score and placental examinations were collected and analyzed. The placental examinations included both macroscopic and microscopic studies.*
Results: *The prevalence of placental pathology in low birthweight infants was 80.7%. The four types of placental pathology were an increased placental to fetal weight ratio, infarction, vascular abnormalities of the decidua, and inflammation in 64.1, 30.4, 20.6 and 18.5 percent, respectively.*
Conclusion: *All placentas of low birthweight infants should be studied for potential pathologies.*

Keywords*:* *Low birthweight infant, Placental pathology*

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Low birthweight infants are newborns weighing less than 2,500 grams at birth and as a consequence their mortality rate due to neonatal complications such as hypoglycemia, hypocalcemia, hyponatremia, hypothermia and polycythemia is eight times greater than normal-weight fetuses[1]. At 20-27 weeks of gestation, the perinatal mortality rate is one case in 100[2]. Due to poorly differentiated organs, preterm infants are at risk of many complications especially acute respiratory distress syndrome and this rate decreases as the gestational age increases.

There are many causes of intrauterine growth retardation (IUGR), one of them being placental abnormalities such as infarction. For example, acute chorioamnionitis of the placenta can cause preterm labour.

Garsia's 1982 study of placental pathology of low birthweight term infants revealed: 1) 74% hematogenous infection; 2) 14% placental circulatory disturbances related to maternal hypertension; 3) 6% abnormal placentation; 4) 4% villous dismaturity; and 5) 2% diffuse chorioangiomatosis[3].

Between 1980 and 1982, Chellam et al examined the placenta associated with low birthweight infants and found chorioamnionitis and funisitis in 48.5% of specimens[4]. To compare, Bortolus et al (1998) observed the placental to fetal weight ratio in 472 women with an increased risk of IUGR tended to increase from the 'large for gestational age' to the 'small for gestational age' infants[5]. Rayburn et al found 92% abnormal histologies of placentas in 151 'small for gestational age' infants[6].

Bjoro[7] (1989) studied the placental pathology in 223 IUGR placentas. The material was divided into subgroups, *viz.* with or without hypertensive complications of pregnancy. Velamentous insertion, single umbilical artery and placental infarction occurred more frequently in the IUGR group than in the control group (which comprised 500 placentas from normal deliveries);

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Table 1. Demographic and data of studying groups (N = 114 cases)

Characteristics	Number (Cases)	%
Age (years)		
0-19	5	4.4
20-35	94	82.4
>35	15	13.2
Gravida		
1	58	50.9
2	36	31.6
3	13	11.4
≥4	3	6.1
Parity		
0	87	76.3
1	18	15.7
2	8	7.1
3	1	0.9
Occupation		
Housewives or unemployed	29	25.4
Merchants	27	23.7
Farmers	25	21.9
Civil servants	21	18.4
Service industry	12	10.5

Maternal underlying disease	Pre-term		Term		Total [%]
	SGA	AGA	SGA	AGA	
No underlying	6	48	15	35	104 [91.2]
Thalassemia	0	0	3	1	4 [3.5]
SLE	1	0	0	2	3 [2.6]
ASD secondum	0	0	0	1	1 [0.9]
DM	0	0	1	0	1 [0.9]
ITP	0	1	0	0	1 [0.9]
Total	7	49	19	39	114 [100]

Complicated pregnancy	Pre-term		Term		Total [%]
	SGA	AGA	SGA	AGA	
PROM	0	18	0	2	20 [17.5]
Preterm labour	2	8	1	0	11 [9.6]
Hypertension in pregnancy	5	2	1	0	8 [7.0]
Antepartum hemorrhage	0	4	0	0	4 [3.5]
Chorioamnionitis	0	3	0	0	3 [2.6]
Leiomyoma	0	1	0	0	1 [0.9]
Ruptured appendicitis	0	1	0	0	1 [0.9]

SLE = Systemic lupus erythematosus
ASD = Atrial septal wall defect
PROM = Premature rupture of the membranes
ITP = Idiopathic thrombocytopenia

thus, a study of the placentas from IUGR infants from normotensive pregnancies should be more thoroughly investigated.

Despite the observed link between placental and newborn health, pathologic examinations of placenta are rarely performed in the authors' institution and thus the causes of low birthweight infants are not well defined.

Material and Method

Placentas from all low birthweight infants delivered at Srinagarind Hospital were routinely examined by one perinatal pathologist. Placentas from multiple pregnancies, induction of labour or dead fetuses in utero were excluded. Between June 2002 and June 2004, 114 infants weighing between 500 and 2,499 grams delivered at Srinagarind Hospital were included.

After receiving written informed consent, the data were collected from 1) hospital records; 2) the attending notes from the Labour Room Admissions; 3) labour records; and, 4) the pediatrician's newborn assessment sheets (i.e. demographic and baseline variables of age, gravida, parity, occupation, maternal underlying disease and complications during pregnancy, gestational age by obstetric information, the Ballard score and birth weight).

The delivered placentas were stored at 6 C to ensure a 'fresh state' pathological examination. Macroscopic studies included: 1) dramatic placental examination and 2) placental weight after being cleared of blood, clots and trimming off the membranes and umbilical cord. Microscopic studies were performed on the tissue samples taken from each placenta, including at least 6 blocks of placental tissue, *viz*.: 1) a transverse section of the umbilical cord; 2) a free membrane section for membrane role; 3) two sections of the parenchyma including the villi and intervillous space from the edge of the placenta; 4) two sections of the parenchyma from the placental center; and 5) one section of each abnormal gross pathology. All of the samples were stained with haematoxylin and eosin.

The pathology of placenta included macroscopic and microscopic lesions. The prevalence of placental pathology, demographics and baseline variables were calculated and presented as percentages.

Results

The demographic and baseline variable data of the 114 pregnant women that enrolled in the present study are presented in Table 1. Most (82.5%) were 20-35 years old, half (50.9%) were primigravida and three-quarters (76.3%) were nulliparous. One-quarter (25.4%) were housewives or unemployed. Most (92.1%) had no underlying disease. The single most common (3.5%) underlying disease was thalassemia. The two most common obstetric complications were prelabour rupture of membrane (17.5%) and preterm labour (9.6%) (Table 1).

In the present study, almost half of the low birthweight infants were preterm. Both the term and pre-term infants were mostly appropriate for gestational age (AGA), (*i.e.* 34.2% and 43%, respectively). Most (91.2%) of the infants had a low birthweight while 8% had a very low birthweight (Table 2).

The authors encountered 172 pathologies in 92 abnormal placentas from 114 placentas (or 80.7%) (Table 3), including 1) a 64.1% increased placental to fetal weight ratio; 2) 30.4% infarction; 3) 20.6% vascular abnormalities of the decidua; and, 4) 18.5% inflammation (Table 4).

Regarding preterm low birthweight infants, three cases of chorioamnionitis were identified clinically, while pathological study revealed 12 cases; therefore, 9 cases were occult chorioamnionitis (Table 5).

In this study, abnormal gross placenta, abnormal fetal membrane and abnormal villi were classified in subgroups (Table 6).

Table 2. Demographic and baseline variables of infants (N = 114 cases)

Gestational age	Number (Cases)	%
Preterm	56	49.1
SGA	7	6.1
AGA	49	43.0
Term	58	50.9
SGA	19	16.7
AGA	39	34.2
Babies weight	N	%
500-1 500	10	8.8
1500-2 499	104	91.2

Table 3. Placental pathology in term and preterm infants (N = 114 cases)

Placenta	Preterm [%]	Term[%]
Normal	4 [3.5]	18 [15.8]
Pathology	52 [45.6]	40 [35.1]

Table 4. Details of placental pathology (N = 92 cases)

Placental pathology	Pre-term		Term		Total [%] (92 cases)
	SGA	AGA	SGA	AGA	
Increased placental to fetal weight ratio	5	30	5	19	59 [64.1]
Infarction	5	14	7	2	28 [30.4]
Vascular abnormality of decidua	2	8	5	4	19 [20.6]
Inflammation	2	10	2	3	17 [18.5]
Abnormal villi	1	11	0	4	16 [17.4]
Abnormal gross placenta	1	7	1	2	11 [12]
Thrombosis	0	5	2	4	11 [12]
Abnormal umbilical cord	0	1	4	1	6 [6.5]
Abnormal fetal membrane	0	1	0	2	3 [3.3]
Abruption	0	2	0	0	2 [2.2]

Table 5. Placental abnormality in preterm with chorioamnionitis (N = 12 cases)

Type of chorioamnionitis	N (%)
Clinical chorioamnionitis	3 [25]
Occult chorioamnionitis	9 [75]
Pathological chorioamnionitis	12 [100]

Table 6. Details of abnormal gross placenta, abnormal fetal membrane and abnormal villi (N = 30 cases)

Abnormal gross placenta	Number (N = 11 cases)
- accessory lobe	7
- circummaginate placenta	1
- incomplete lobe	1
- superficial artery diameter smaller than superficial vein diameter of fetal surface	2
Abnormal fetal membrane	**Number (N = 3 cases)**
- loss of membrane	2
- persistent villi at fetal membrane	1
Abnormal villi	**Number (N = 16 cases)**
- more terminal villi	8
- perivillous fibrin	2
- chronic villitis	2
- acute villitis	1
- ischemia	1
- chorangioma	2

Discussion

In Europe, the prevalence of placental pathology for 'small for gestational age' and low birthweight infants is 92 and 100 percent, respectively[3,6]. By comparison, we documented a prevalence of 80.7%, perhaps because the fact that the presented data also included both term and AGA infants. Importantly, the authors found no placental pathology among the low birthweight because of constitutionally small mothers.

Low birthweight infants often had more than one type of pathology; the 92 infant subjects had 172 placental pathologies with multifactorial causes. Prevention and treatment have to be considered for each factor. The pathology found most was the increased placental to fetal weight ratio, which was also observed by Lao et al[8].

In biological terms, placental hypertrophy may be an adaptation to maternal under-nutrition, thereby sacrificing fetal growth. Bortolus et al[5] found evidence to support the hypothesis that under-nutrition in utero may either restrict or stimulate placental growth, depending on its timing and severity. Severe maternal under-nutrition restricts growth of both the fetus and placenta, while mild under-nutrition may lead to increased placental size, but not fetal size. Another possible explanation is that placental infarction may increase placental weight and decrease birthweight.

By comparison, Chellam and Rushton[4] demonstrated that inflammation was highest by 48.5%, perhaps because the study was done in preterm infants. They also observed that 23.7% of them had PROM but the authors found only 18.5%. Fox[9] found placental inflammation between 2.2 and 39% of specimens, the

higher proportion occurring in high-risk pregnancies. Meanwhile 92.1% in the present study had no underlying disease.

The authors found three cases of clinical chorioamnionitis while the pathological studies revealed 12 cases of chorioamnionitis in preterm group, thus 75% in this group were occult chorioamnionitis. Future studies should divide the population into two groups, preterm and IUGR infants, in order to compare the placental pathologies. The utility of the present study is the stimulation of future placental pathology research.

Conclusion

In conclusion, the prevalence of placental pathology among low birthweight infants was rather high. Placental pathology examination will likely more accurately reveal the cause(s) of low birthweight infants. Therefore, all placentas of low birthweight infants should be studied for potential pathologies.

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ความชุกทางพยาธิวิทยาของรกในทารกน้ำหนักน้อย

พิไลวรรณ กลีบแก้ว, วิทยา ลิ้มดำรงค์ชิต, ถวัลย์วงค์ รัตนสิริ, รัตนา คำวิลัยศักดิ์, กนก สีจร

วัตถุประสงค์: *เพื่อหาความชุกทางพยาธิวิทยาของรกในทารกน้ำหนักน้อยที่โรงพยาบาลศรีนครินทร์*
วัสดุและวิธีการ: *เป็นการศึกษาแบบพรรณนา ของรกที่คลอดจากทารกน้ำหนัก 500-2,499 กรัม ในระหว่าง มิถุนายน พ.ศ. 2545 - มิถุนายน พ.ศ. 2547 จำนวน 114 ราย จากห้องคลอด โรงพยาบาลศรีนครินทร์ และทำการตรวจที่ห้องตัดชิ้นเนื้อ ภาควิชาพยาธิวิทยา คณะแพทยศาสตร์ มหาวิทยาลัยขอนแก่น โดยหลังจากทารกน้ำหนักน้อยคลอด รกจะถูกเก็บเพื่อส่งตรวจโดยพยาธิแพทย์ปริกำเนิด ข้อมูลของสตรีที่เข้าร่วมโครงการทางด้านลักษณะประชากร อายุครรภ์ทารก ประเมินจากข้อมูลทางสูติศาสตร์ และโดย Ballard score และ ผลการตรวจรกจะถูกบันทึกและนำมาวิเคราะห์ ซึ่งผลการตรวจรกจะประกอบด้วยการตรวจทางมหกายวิภาคและทางจุลพยาธิวิทยา*
ผลการศึกษา: *พบความชุกทางพยาธิวิทยาของรก คิดเป็นร้อยละ 80.7 ในกลุ่มที่มีพยาธิวิทยาของรกพบอัตราส่วนน้ำหนักรกต่อ ทารกที่เพิ่มขึ้น ร้อยละ 64.1 รกขาดเลือดร้อยละ 30.4 ความผิดปกติของหลอดเลือดที่ชั้นเยื่อบุโพรงมดลูกขณะตั้งครรภ์ ร้อยละ 20.6 และรกอักเสบ ร้อยละ 18.5*
สรุป: *รกของทารกน้ำหนักน้อยทุกรายควรได้รับการตรวจทางพยาธิวิทยากับพยาธิแพทย์ที่มีความเชี่ยวชาญ*