STUDY OF CHANGES IN PLACENTAL MORPHOLOGY FATE OF FETUS IN ANAEMIC MOTHERS

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ABSTRACT- Anemia in female during pregnancy is very common, it affect maternal blood leading to maternal hypoxia. Anemia also exerts profound changes on the maternal circulatory system and has serious effects both on mother and fetus. Growth of fetus is intricately linked with that of placenta, because placenta causes transfer of nutrients as well as oxygen from mother to fetus. So chances of Low birth weight baby and premature delivery increases. Hypoxia cause morphological changes in placenta like increased weight, diameter & thickening of placentas. Placenta is a focus of increasing interest in modern obstetrics because significant pathology afflicts the placenta, often before affecting the fetus. Placental abnormalities therefore can be an 'early warning system' for fetal problems. The evaluation of placenta thus becomes essential in high risk pregnancy. As most of the perinatal fetal deaths, were related to the insufficient oxygen supply in utero, placenta plays a pivotal role in the transport of oxygen to the fetus. , it remains major path finder for the ultimate goal of healthy fetal outcome. Therefore study of placenta is a valuable tool in predicting the outcome of future pregnancies and their management.

KEY WORDS - anemia, hypoxia, placenta

INTRODUCTION - Placenta a vital organ which is absolutely essential for survival, growth & development of fetus. Its functions are complex, includes fetal oxygenation, nutrition, excretion, endocrine Function (synthesis of estrogen and progesterone) detoxification of drugs. So it is most potent organ; but life span is shortest .It is a most interesting but unfortunately often ignored and misunderstood organ and known to laity as 'after birth'.

Any disease either associated or aggravates with pregnancy, like hematological disorder, diabetes & hypertension affects the placenta.

The human placenta is a flattened discoidal mass with an approximately circular or oval outline with an average weight about 500 grams. (Range 200-800 grams.), average diameter 18 cm. (Range 15-20 cm) It is thickest at centre (The original embryonic pole) and it rapidly diminishes in thickness towards its periphery. It has two surfaces, designated as the maternal surface which appear rough, shaggy, reddish, and is subdivided by depressions of varying depth into a number of irregularly shaped areas, the so called cotyledons, which vary considerably in number, average about corresponding to major maternal vascular units (Major branches of distribution of the umbilical vessels) and this is particularly well seen in specimens which have been x-rayed after intravascular injection of radio-opaque media. The grooves correspond to the bases of incomplete placental septa.

That surface of placenta which is directed towards the cavity of the ovum is designated as the fetal surface. This surface is covered by smooth glistening amnion with an umbilical cord attached near its centre. The branches of umbilical vessel radiate peripherally from the cord.

ADVERSE EFFECT OF ANAEMIA IN PREGNANCY - Auinger W¹ studied the influence of anemia on the weight of the newborn baby. Weight of baby in the anemic group was less than in non-anemic group. In contrast the placenta showed an increase in weight.

Fox³ speculated that increased size of placenta in maternal anemia was indicative of compensatory mechanism by which the placenta attempts to overcome the diminished content of oxygen in the maternal blood.

Khanna et al⁷ studied 44 placentas from anemic mothers, there was significant decrease in placental weight volume, surface area and number of cotyledons in them).

MATERIAL AND METHOD - 60 Placentas, neonates and mothers constituted the material for present study. Placentas were collected along with detailed case history and relevant investigations of neonates and mothers. Permission for collecting material has been given by ethical committee. Placentas were collected immediately after delivery. Placentas were washed with normal saline and preserved in 10% saline for microscopic examination.

This study was divided into 2 groups-

Group I Control Group: It comprised of 30 placentas from mothers having no signs and symptoms of anemia and their hemoglobin level were recorded to be more than 11gm%

Group II Study Group: It comprised of 30 placentas obtained from anemic mothers whose hemoglobin levels were less than 11 gm%. According to the WHO¹⁴ classification of anemia (depending on women's hemoglobin level) placentas divided into 3 groups -

Group II a -Mild anemia (Hemoglobin level 11 gm/dl-10 gm/dl)

Group II b – Moderate anemia (Hb level 10- 7gm/dl)

Group II c – Severe anemia (Hb level < 7 gm/dl)

Each group II contains 10 Placentas.

Inclusion Criteria for selection of cases-

- 1- All cases belonging to age group 20- 35
- 2- Gestational age ranging from 28-42 weeks
- 3- We have taken primi as well as multi gravida.
- 4- They had no racial, cultural or environmental differences.
- 5- The mothers not have any systemic disease (ant partum hemorrhage, toxemia of pregnancy, blood group incompatibility).

Gestational age was recorded by per abdominal examination of patient to know the gestational weeks of pregnancy irrespective of whether patient was sure of LMP (First day of last menstrual period) or not.

Gross examination of placenta -

1. We examine placentas as soon as possible after delivery in the fresh state.
2. We noted the amount of blood and clots in the container and search for separate pieces of membranes, cord and placenta.

3. Attachment of umbilical cords to placentas were noted whether central, eccentric or Velamentous, number of umbilical vessels, true knots, torsion, stricture, hematoma, thrombosis were examined.
4. Umbilical cord was cut one centimeter from the placental surface and the membranes were trimmed off. Adherent blood clots were removed with a gauze piece from the placenta and the sub chorionic vessels were emptied of blood by gentle pressure. The placenta was blotted with filter paper and weighed. It was measured by single pan weighing scale machine. Each placenta was weighted accurately in grams.
5. Any abnormality in placenta, such as accessory lobe or Bi-lobed placenta was also recorded.
6. The fetal surface was examined for color, opacity, thrombosis of fetal surface vessels.
7. The maternal surface was examined for completeness, normal fissures, laceration, depressed areas, and retro placental hemorrhage.
8. The maximum diameter, thickness in the centre, weight and shape was noted.

Study of Human Placenta and its relevance to mother and fetus was done under following headings-

(a) Placenta – gross Anatomy

1-Weight – by - Single pan physical balance

Fibrosis – On the maternal surface near the periphery, Patchy areas of fibrosis seen.

2- Umbilical cord insertion – Whether centric, eccentric or velamantous.

(b) Mother :

1- Name

2- Husband's Name

3- Age

4- Residence – Rural / Urban

5- Socio – economic status

6- Habit – Smoker/ Alcohol

OBSERVATION AND RESULTS

Present study was divided in two groups-

Group I – Control group (30 Cases)

Group II – Study group (30 Cases)

The study group was further divided according to severity of anemia.

Group II a – Cases of mild anemia – 10 Cases

Group II b – Cases of moderate anemia – 10 Cases

Group II c – Cases of severe anemia – 10 Cases

Table I: Incidence of cases in various groups

Groups	No. of cases	Percentage of cases
I	30	50
IIa	10	16.66
IIb	10	16.66
IIc	10	16.66

Following factors were undertaken to accomplish the study-

1- **MOTHER** – Observation based on clinical examinations

(i) Parity

(ii) Gestational age of fetus / Gestational weeks of mothers

2- **PLACENTA** - Morphological Examination

FOETAL OUTCOME - (i) Birth Weight

(ii) Maturity level

1- MOTHERS

(i) Parity – In control group 67% were primigravida and 33% were multi gravida, whereas in anemic group 33% were found to be primigravida and 67% were multi gravida.

Table II: Incidence of cases of primi gravida and multi gravida in both groups.

Groups	Primi gravida		Multi gravida	
	No.	%	No.	%
II	20	67%	10	33%
	10	33%	20	67%

(ii) **Gestational Age:** The gestational ages of fetus were calculated from last menstrual period (LMP) and by doing per abdominal examinations in both groups.

It was observed that in the control group 87% were delivered in the gestational age of 37 to 40 weeks. Rest of the cases were found to be either less than 37 weeks of gestation or more than 40 weeks of gestation, whereas in the study group higher incidence was in the gestational age of less than 37 weeks considering all the anemic group.

Table III: Incidence of cases according to gestational weeks in various groups-

Groups	<37 Weeks		37- 40 Weeks		40 - 42 Weeks	
	No	%	No	%	No.	%
I	2	6.5	26	87	2	6.5
II a	2	20	6	60	2	20
II b	4	40	4	40	2	20
II c	5	50	4	40	1	10

PLACENTA

Table I: Mean Placental weight and diameter in various groups.

Groups	Mean placental weight (in gm)	Mean placental Diameter (in cc)
I	480	16
II a	500	17
II b	480	16
II c	350	15

In Control Group – Mean Placental weight – 480 gm.

In study group – Decrease in Placental weight with severity of anemia.

Table II – Incidence (in %) of various types of shapes in both groups.

Groups	Discoidal	Circular	Oval	Bilobed
I	77	23	0	0
II	63.5	32	3.23	1.27

In control group – Most common shape – Discoidal

In study group – Most common shape – Discoidal (63.5%) but circular shape is more than study group because with severity of anemia surface area of placenta was reduced making the shape circular.

Table III- Number of maternal cotyledons in various groups-

Groups	Average No. of maternal cotyledons
I	17
II a	14
II b	11
II c	08

Number of cotyledons decrease with severity of anemia.

Fibrosis (Fibrin deposition)- White patchy areas of fibrosis were found in both groups. It was present in 6% cases of control, 20% cases in group II a, 25% cases in group II b, and 65% cases in group II c.

Umbilical cord insertion

Table IV – Incidence of various types of umbilical cord insertion in both groups.

In control group- Most common type of umbilical cord insertion – Central.

Type of U.C. Insertion	Control Group (% of cases)	Study Group (% of cases)
Central	67	40
Eccentric	33	58
Velamentous	0	2

In study group – Most common type of umbilical cord insertion – Eccentric

FETAL OUTCOME -

Fetal outcome categorized under the following headings-

- (i) Low birth weight by (L.B.W. baby) – L.B.W. baby was taken as one whose birth weight was <2500 gm, irrespective of gestational age.
- (ii) Full term baby – A baby born anytime between 37-42 weeks of gestation was considered as full term baby.
- (iii) Intrauterine death (I.U.D.) - In our study any fetal death beyond 28 weeks was termed as I.U.D.
- (iv) Premature baby- A baby born before 37 weeks of gestation was considered as full term baby.

Table V - Incidence of cases of fetal outcome in study group.

Groups	I.U.D. No. of Cases	Premature baby No. of Cases	L.B.W. Baby No. of Cases	F.T.N.D. No. of Cases
I	0	0	0	30
II a	0	2	4	4
II b	1	3	3	3
II c	2	4	4	0

It was observed that in control group no cases were found of I.U.D. prematurity, L.B.W. baby. 100% cases were delivered as full term baby.

In study group cases of I.U.D, cases of prematurity, and cases of L.B.W. baby increase with severity of anemia and cases delivered as full term baby less in comparison to control group.

DISCUSSION: It was found in all cases of study groups that total period of gestation decreases with the severity of anemia.

In our study 33.33% cases were noted at less than 37 weeks. Vijaylaxmi et al¹³ also observed in their study of 1040 cases that mothers delivered at < 37 weeks of pregnancy were 3.9% in non-anemic cases and 26% in anemic cases.

The present study also correlates findings of high incidence of premature baby (40%), low birth weight baby 40%, and fetal loss (20%) with the increase in severity of anemia. It was observed by Kelly⁷ that woman with mild anemia had a 30-40% increased risk and those with moderate to severe anemia had about 70% increased risk of preterm birth. This has attributed due to degenerative changes, where placenta could not further compensate to the insult caused by hypoxia.

Usha Russia¹² et al studied 52 cases out of which 30% were of mild anemia, 40% were of moderate and another 30% were of severe anemia and they found that the placental weight of the severely anemic mothers were significantly lower than those of other two groups. Small placental weight associated with anemic mothers was also reported by Wong et al¹⁵ and Purnima⁹ explained that small placenta of severely anemic mother is due to retarded growth of placenta with decrease in total placental DNA suggesting decrease in cell number and thus reduction in size, where there is early stop of cell division in anemia (normally cell division stops after 36 week of gestation).

Contradictory findings of heavier placenta are given by Beisehler² and Godfrey⁴ explaining that maternal anemia causes inadequate oxygenation of the feto-placental unit and in term invokes physiological response resulting in compensatory placental hypertrophy which is an adaptation to a physiological stress.

So conclusion is that due to mild to moderate anemia in mother because of hypoxia compensatory placental hypertrophy occur. But in severe anemia, placenta affected so much that it cannot go under compensatory hypertrophy.

SUMMARY AND CONCLUSION: In the present study morphological changes in placenta of anemic mother is undertaken to study effects of anemia on gestational age of fetus, fetal outcome, morphology of placenta

It was found that period of gestation decreased with severity of anemia. Various workers have attributed this was due to degenerative changes

Prematurity and low birth weight increased in severe anemia. This is attributed to early maturity of placenta, because of hypoxia.

Placentas from anemic mothers have comparatively low weight.

In present study number of cotyledons decreased with severity of anemia (average no of cotyledons in control group 17, in study group 11) this was put by Olga⁸. Olga in his study of placenta of anemic mothers found that there is reduction in the number of lobes defined on maternal surface. This correlates with our present findings. P.N. Singha¹⁰ attributed this reduced number of cotyledons in placenta of anemic mothers as an indication of lesser degree of septation and probably a greater proportion of functional parenchyma, which is an adaptation to physiological stress.

Present study also showed that the umbilical cord insertion was more towards margin. (In study group 58% of cases were eccentric whereas in control group it was 33% with increase in severity of anemia, cords has eccentric type of attachment. Hamilton Boyd⁵ and Mossman⁵ have described the attachment of cord as central, eccentric, marginal (Battledore Placenta) and rarely velamentous.

In present study we found discoidal shape placenta (77% in control group and 63.5% in study group) circular shape (23% in control group and 32% in study group) and oval 3.23% and bi-lobed or with accessory lobe 1.27% (Both found in study group only) Thangula¹² and vijayalaxmi¹⁴ found that with the severity of anemia, surface area of placenta was reduced making the shape circular.

The present study also showed that incidence of fibrosis increases with increase in severity of anemia.

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Fig- Showing measurement of weight of placenta

Fig-Showing measurement of diameter of placenta

Fig- Gross morphology of placenta of Control group showing discoidal shape and Umbilical cord is attached eccentrically.

Fig- Gross morphology of placenta of control group showing circular shape

Fig- Gross morphology of placenta of study group showing discoidal shape with Eccentric attachment of umbilical cord

Fig- Circular Shaped Placenta of study group showing central attachment of umbilical cord

Fig- Gross morphology of placenta of study group showing foetal surface with velamentous insertion of umbilical cord

Fig- Gross morphology of placenta of study group showing maternal surface with velamentous insertion of umbilical cord.

Fig -Gross morphology of placenta of study group showing circular shape with dual umbilical cord

Fig- Gross morphology of placenta of study group showing bilobed placenta

Fig- Method of measuring thickness of placenta by needle.

Fig- Calculation of thickness using venire caliper

Fig - Gross morphology of placenta showing cotyledons on maternal surface.

A) Control Group

B) Study Group- Placenta Size is smaller than control group, and showing less cotyledons

GRAPHS:

Comparison of incidence of cases of primi gravida and multi gravida in Control and study group.

Bar Chart showing incidence of cases in percentage according to gestational weeks in various groups

Bar Chart showing weight & diameter of placenta in both control and study groups.

Bar Chart showing various shapes of placenta by comparing control group with study groups.

Bar Chart showing average No. of maternal cotyledons in both control & study groups.

Bar Chart showing incidence of various types of umbilical cord insertion in both groups.

Bar chart showing foetal outcome in various forms by comparing control group with study group.

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