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The study of morphology of placenta in anaemic subjects in south Indians

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***Abstract*---**Placenta is the mirror of fetomaternal status. The effect of anemia in pregnancy can be diverse and detrimental to the mother and the fetus. The placenta also plays an important role in hormone production and releases hormones into both the maternal and fetal circulations to affect pregnancy, metabolism, fetal growth, and parturition. Earlier in developing countries women often become anemic during pregnancy because the demand of iron and vitamins will increase. Fetuses are at risk of preterm deliveries, low birth weight due to impairment of oxygen delivery to placenta and fetus.The study was carried out to study the morphology of placenta in anaemic subjects. Material and method - In the present study,50 placentae, 10 from normal pregnancies (control group) and 40 from anaemic mothers (study group) were studied.The parameters studied were mean placental weight, volume, diameter, average thickness, no. of cotyledons, presence of infarction, calcification and site of attachment of umblical cord & no. of blood vessels in cord. From the study it is concluded that anaemia affects placental outcome. It was concluded from the study that the weight of newborn baby is significantly low in anemia and it further decreased according to severity of anemia. Thus, placenta acts as an effective index, by examination of which we can predicate the status of the fetus in neonatal life.

***Keywords*---**Placenta, morphology, anemia, Maternal anaemia, Morphological changes, Placental weight.

Introduction

Placenta is the most accurate record of the infants' prenatal experience [1]. It is the vital organ for maintaining pregnancy and promoting normal fetal development. The human placenta is a flattened discoid organ, which connects the fetus with the uterine wall. It has a maternal component, decidua basalis and a fetal component, chorion frondosum. The fetus and the placenta share the same genetic makeup and so therefore both should be expected to possess parallel growth potentials. Maturation of placenta causes an increase in the placental nutrient transfer capacity and thus improves placental efficiency, permitting an increase in the number of grams of fetal weight supported by every gram of placental mass. Not surprisingly "Placental insufficiency" is invoked commonly in case of impaired fetal growth [2].

The placenta is an extremely complex piece of biological structure. It is a little bit like an artificial kidney, it allows mother blood and baby blood to come into very close contact but without ever mixing. The placenta acts like a sieve, moving oxygen and nutrients from the mother's body to baby and taking carbon dioxide and waste materials from the baby into mother's body for elimination. The blood vessels of the mother and baby are incredibly close together at the site where the placenta is attached to uterus. However, remarkably the blood flows always completely separate whilst facilitating vital exchange. The placenta can help to protect the fetus against certain xenobiotic molecule, infections and maternal diseases. Early placental development is characterized by the rapid proliferation of the trophoblast and development of chorionic sac and villi.[3] Placenta is classified into 2 types one is disperse and other is magistral.[4] Placental weight is around 500–600 g usually one-sixth of the fetal weight and thickness is 2.5 cm. [5] The umbilical cord is usually attached at the center. Anemia is an important public health problem worldwide and the most vulnerable group is pregnant women and children. In developing countries women often become anemic during pregnancy because the demand of iron and vitamins increased. Fetus are at risk of preterm deliveries, low birth weight due to impairment of oxygen delivery to placenta and fetus. Placenta being exchange organ its morphologic study may throw some light on the issue. A thorough study of placenta may record certain alteration which could be correlated with maternal conditions like anaemia and which could be of value and in terms of predicting fetal outcome.

Material and Methods

The study was conducted in the department of anatomy Bhaarat Medical college & Hospital, Chennai and Malabar Medical college, Hospital and Research centre, Modakallur, Kozhikode. The placentae were collected from labour room and from gynaecological operation theatre. A total of 50 placentae were studied, out of which 40 cases from anaemic (study group) and 10 cases from normal pregnancies (control group). The serial numbers of placenta and mother were same. On admission into the labour room a detailed history in respect of name, age, address, husbands name, occupation, menstrual history, gravidity and parity were noted from clinical records. Mothers were examined for height, weight, built, B.P. along with recording of their investigations. USG report recorded from the clinical records. Placentae with 10 cm long stump of umblical cord and

membranes collected soon after the normal vaginal delivery or caesarian section. Any abnormality of cord and membrane was noted, adherent blood clots were removed from maternal surface, placentae were washed in running tap water. An accurate weight, volume (by water displacement method), diameter, average thickness,shape, number of cotylelons, presence of infarction, clacification, site of attachment of umblical cord, no. of blood vessels in umbilical cord were noted.

Results

Table. 1: Morphometry of placenta

Figure. 1: Morphometry of placenta

Graph.1: Mean of placental morphometric variables in study groups

Table.1shown that the mean placental weight in control group is 424 ± 69.16 gms while in study group is 474.53 ± 70.132 gms, the difference is significant ($P<0.05$). The mean placental volume in control and study groups is 352.31 ± 58.12 & 393.13 ± 63.632 ml respectively and this difference is also significant (as $P<0.05$). Similarly, the mean diameter in control and study groups is 17.032 ± 1.809 cms and 18.303 ± 2.02 cms respectively with significant ($P<0.05$) difference. The mean thickness in control and study groups is 2.13 ± 0.28 & 2.410 ± 0.570 cms respectively and this difference is also significant (as $P<0.05$). In our study the mean of number of cotyledons in control group is 16 ± 2.31 and in study group 13.23 ± 3.10, the difference is statistically significant ($P<0.05$). In the present study shape of placenta found to be discoidal in 55% cases among normal placenta and oval in 63.2% cases of anaemic group. Placenta with accessory lobe is found in anaemic group. In our study sub chorionic haematoma is found in anaemic case.

Blood vessels of umbilical cord in all placentae showed presence of 3 blood vessels i.e., 2 arteries and 1 vein except one placenta of anaemic group had one artery and one vein in umbilical cord.

Discussion

The placenta is highly specialized organ of pregnancy that supports the normal growth and development of the fetus. Growth and function of the placenta are precisely regulated and coordinated to ensure the exchange of nutrients and waste products between maternal and fetal circulatory systems. Placenta being the fetal organ shares same stress and strain to which the fetus is exposed. Thus, any disease process affecting mother and fetus also has great impact on placenta. In the present study the mean placental weight is 425gm ± 69.16 gms in normal group and anaemic group the placental weight is 474.53 ± 70.132 gms. It is clear that the mean placental weight is significantly increased in anaemic group as compared to control group. Similar findings were noted by Beischer et ai [6], Akin agboola [7]. Mongia, Yadav, Jain [8] also observed similar findings in anaemic group. Barker et al (1990) [9], Godfrey et al (1991) [10] , and Lao and Wong [11] observed the same findings. Dhall (1990) [12] observed that the weight and

volume was reduced in anaemic group but the difference was stastically insignificant.

Thus, any disease process affecting mother and fetus also has great impact on placenta. Agbola[13] studied 199 and 25 placenta from anemic mothers respectively and observed that maternal anemic was associated with placental hypertrophy. Agbola [13] also observed that mean placental weight in control group was lower than study group. Chung[14] studied 378 randomly collected placentas for study of biometrics of placenta. To the contrary they observed that placental weight of anemic mothers was lower than control group. Hosemann [15] reported that placental weight increases in anemia. Sinclair [16] in a study concluded that placental weight was lower in anemic mothers compared to healthy mothers. Dhall [17] observed that mean placental weight in anemic mothers was lower compared to healthy mothers though the difference was not significant statistically. Baptiste's [18] study of maternal risk factors for abnormal placental growth also observed increased placental weight in anemic mothers.

In our study the placental volume is 352.31 ± 58.120 ml in control group and 393.13 ± 63.632 ml in study group. The placental weight is significantly increased in anaemic group as compared to control group. Similar findings were noted by Begum, Nurunnabi [19]. This finding was in accordance with those of Mongia, Yadav, Jain [8]. Volume of the placenta is proportional to its weight [20]. Placental volume is markedly reduced in abnormally small babies [21]. Volume of placenta is increased in male babies than females [22]. Because of the fact that placenta has a normally unrealized potential for incremental growth [23-26], certain patho-physiological conditions such as high altitude, severe anemia and maternal heart failure are associated with unusually large placental volume.

The maximum & the minimum diameters were measured by the measuring tape. Thickness of each placenta was measured at its centre & three other places by piercing the placenta by a long needle calibrated in cm. The average thickness of the placenta was measured to the nearest 0.1 cm. The placental diameter is 17.032 ± 1.809 cms in control group and 18.303 ± 2.03 cms in study group. Thagaleeta et al [27] also observed the significant difference in diameter among different group. The placental thickness is 2.13 ± 0.28 cms in control group and 2.410 ± 0.570 cms in study group. This finding is significantly increased in anaemic group as compared to control group. Lao and Wong [11] also found the placental thickness higher in anaemic group. Mean thickness of placenta at the site of insertion of umbilical cord does not show significant difference between the healthy and anemic groups. So, thickness of placenta is not much affected by anemia. Hence, it cannot be used as a reliable criterion for identification of ane-mia.

Research on big placenta and anemia in pregnancy stated that anemia in pregnant women is a dangerous factor. Their babies will experience hypoxia and stimulate the growth of the placenta, resulting in significant changes in the morphology and histology of the placenta. Research on differences in birth weight and placental weight in pregnant women with anemia and no anemia showed that the placental weight is lower in pregnant women with anemia than the latter. A quantitative (stereological) study of placental structures in pregnant women with

iron-deficiency anemia explained that placental hypertrophy connects to mild and moderate anemia in pregnant women. Meanwhile, the expansion of the placenta is a physiological growth unit of the placenta itself. The hemoglobin levels of pregnant women in the third trimester have no correlation with the length of the umbilical cord and the round or oval shape of the placenta. Until now, there has been no research explaining the shape of the placenta, umbilical cord insertion, thickness of the placenta at the umbilical cord insertion site, has any correlation with anemia. Most of the placentas in pregnant women with mild, moderate, and severe anemia are round and oval. Anemia in pregnant women affects the growth process of the placenta during pregnancy. If they experience severe anemia at the beginning of pregnancy, it could affect the weight of the placenta and the structure of the placenta, thus it affects the transport of nutrients and oxygen to the fetus. Hemoglobin levels of pregnant women in the middle of the second trimester has more effect on the size of the placenta.

Conclusion

Thus, placenta acts as an effective index, by examination of which we can predicate the status of the fetus in neonatal life. Most of the findings of the present study were in accordance with the previous studies in this field. Placenta being a fetal organ shares the same stress and strain, to which the fetus is exposed. Any disease process like anaemia affecting the mother also has a great impact on placenta and fetus. From the study it is concluded that the anaemia adversely affects placental outcome. If the disease is diagnosed at an early stage by frequent monitoring and clinical examinations added precaution can be instituted during antenatal period to reduce for the risk to mother and fetus. Anemia in the late trimester will also affect the structure of the placenta. The placenta shows compensatory mechanisms which tend to limit the ill-effects of both tissue injury and unfavorable maternal milieu like anemia.

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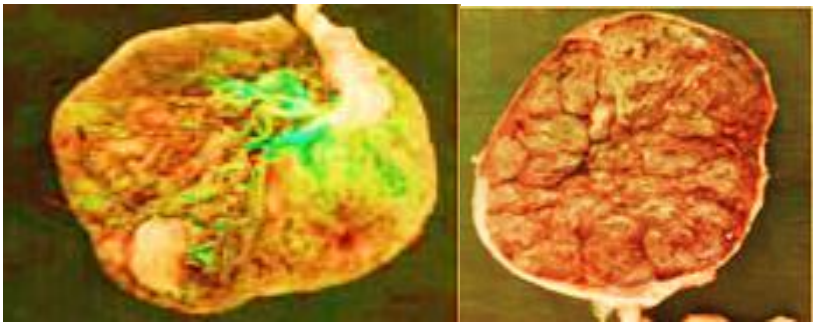
Table. 1
Morphometry of placenta

Parameter	Normal			Anaemia			Significant
	Mean	Std. Deviation	N	Mean	Std. Deviation	N	
Weight Pl	424.00	69.16	2O	474.53	70.132	80	2.81p<0.05
Vol. Pl	352.31	58.120	20	393.13	63.632	80	2.72 p<0.05
Mean diameter	17.032	1.8091	20	18.303	2.02	80	2.70 p<0.05
Thickness	2.130	0.289	20	2.410	0.570	80	6.55 p<0.05
Cotyledons	16.00	2.310	40	13.23	3.104	80	4.36 p<0.05

Figure. 1
Morphometry of placenta
Different Size of Placenta



Placenta with Accessory Lob

Placenta with Single Umbilical Cord

Graph.1
Mean of placental morphometric variables in study groups