

A Study of Umbilical Cord Attachments in Placentas from Anaemic Mothers

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ABSTRACT

Introduction: The placenta is an important organ that performs many vital functions for the maintenance and growth of the foetus during pregnancy. The umbilical cord acts as a link between the developing foetus and the placenta. It transfers oxygen and essential nutrients from the mother to the foetus and transports waste products for elimination from the foetus to the mother. Anaemia is one of the most common disorders that effects pregnant women of developing countries. It is seen to influence the morphology of the placentas and umbilical cords, and hence can affect the outcomes of pregnancies. This study was done to observe and record any variations seen in attachment of the umbilical cord in placentas from anaemic mothers.

Material and Methods: 150 placentas were obtained from the OBG Department of SRMS IMS, Bareilly, U.P. Adequate history was taken from the mothers and haemoglobin values were recorded. The placentas were washed, cleared, and site of placental attachment of umbilical cord were observed. Variations in the type of insertions were noted.

Results: Placental attachment of umbilical cord was found to vary from central and eccentric to marginal with a few velamentous attachments. When the site of umbilical cord attachment was correlated with haemoglobin values it was observed that the incidence of abnormal attachments of umbilical cord was higher in anaemic patients in comparison to the controls.

Conclusion: A normal pattern of umbilical cord attachment to the placenta is overwhelmingly not seen in placentas from anaemic mothers. This requires further study and correlation with foetal outcomes.

Keywords: Umbilical Cord, Placentas, Anaemic Mothers

the placenta. Its various sites of attachments are central, eccentric, velamentous, marginal and furcate.

- Central: Normally the umbilical cord attaches to the center of the placenta.
- Eccentric: It refers to the lateral insertion of the umbilical cord at a distance more than 2cm away from the placental margin.
- Marginal: The cord is said to be attached marginally when it is at a distance of less than 2 cm from the placental margin.
- Velamentous: It refers to insertion of the umbilical cord into the chorion laevea at a point away from the placental edge, and the vessels pass to the placenta across the surface of the membranes between the amnion and the chorion.
- Furcate: This type of umbilical cord insertion refers to the separation of umbilical cord vessels prior to their attachment into the placenta³.

According to WHO guidelines, a level of haemoglobin below 11 gm/dl is an indication of maternal anaemia. Anaemia is the most common nutritional deficiency disorder in the world. WHO has estimated that the prevalence of anaemia in pregnancy in developed and developing countries is 14 and 51% respectively⁴. When it co-exists with pregnancy it has many adverse effects on the health of mother as well as the foetus.

The aim of the present work was to identify and recognize the variations in the site of umbilical cord insertion in placentas derived from mothers with anaemia in pregnancy and to compare the findings with those obtained from the control group.

INTRODUCTION

The umbilical cord is a narrow tube-like conduit that connects the foetus with the placenta. It begins to develop 5 weeks after fertilization and continues to progressively increase in length up to the end of second trimester. It is embryologically derived from both mother and fetus and normally contains two arteries and one vein, buried within Wharton's jelly and all enclosed within a layer of amnion. Its approximate diameter is about 1 cm or more.¹

Deoxygenated blood from the foetus passes to the placenta via the two umbilical arteries of the umbilical cord. Oxygenated blood returns to the foetus by passing through the venules of the chorionic villi which unite to form a single umbilical vein in the umbilical cord².

The umbilical cord varies in its site of attachment to

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How to cite this article: Khan AZ, Paiker M, Srivastava G, Qadeer F, Haque M. A study of umbilical cord attachments in placentas from anaemic mothers. International Journal of Contemporary Medical Research 2020;7(10):J1-J4.

DOI: <http://dx.doi.org/10.21276/ijcmr.2020.7.10.8>



MATERIAL AND METHODS

This study was done in the Department of Anatomy of Shri Ram Murti Smarak Institute of Medical Sciences and Research (SRMSIMS), Bareilly, and Integral Institute of Medical Sciences and Research, Uttar Pradesh, in association with the Department of Obstetrics and Gynaecology and the Department of Pathology after taking required ethical clearance from the institutional ethical committee.

One hundred fifty full term placentas were randomly collected over a period of one year, from mothers who delivered either vaginally or by caesarean section. Relevant history was taken and results of haematological investigations were recorded. The placentas were classified into control and study group (anaemic group). Under each group 75 placentas were studied.

Inclusion criteria

Control group:

1. Single, uncomplicated pregnancy
2. Gestational period: 37- 41weeks
3. Haemoglobin: ≥ 11 g/dL

Study group

1. Single, uncomplicated pregnancy
2. Gestational period: 37- 41weeks
3. Haemoglobin values ≤ 11 g/dL

Exclusion criteria

1. Associated obstetric complications of pregnancy e.g. gestational hypertension, fibroids, retroversion of uterus, cervical cancer, ovarian cysts, venous thromboembolism etc.
2. Any systemic disorders or chronic illness of the mother
3. Any other associated medical disorders of pregnancy
4. Any gross abnormality of the placenta
5. Twin pregnancies

Once the placentas were classified into control and anaemic groups, the site of umbilical cord attachment was recorded, and the placenta was photographed.

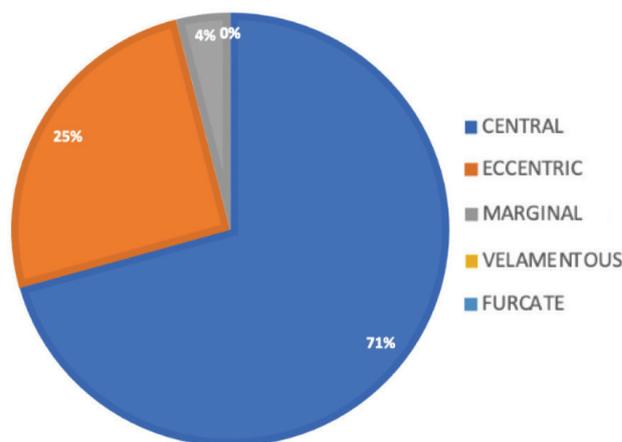
RESULT

The mean haemoglobin in the control group was 11.65 ± 0.39 mg/dl. It ranged between 11-12.3 mg/dl. In the anaemic

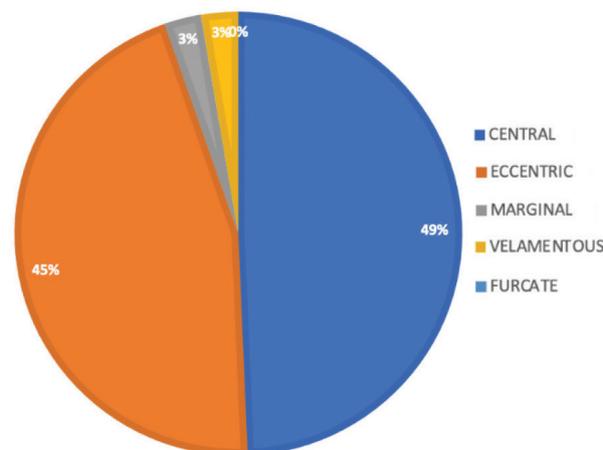
group, the mean haemoglobin was 8.06 ± 1.09 mg/dl and it ranged from 5.9-9.6mg/dl. When this value was compared with the mean value obtained for the control group, it was found to be statistically significant. ($p < 0.0001$) (Table 1)

The umbilical cord varied in its site of attachment to the placenta. Its various sites of attachments were Central (Image 1), Eccentric (Image 2), Marginal (Image 3), Velamentous (Image 4) and Furcate.

In control group, 70.67% placentas (53/75) had a central attachment of the umbilical cord. 25.33% (19/75) were



Graph-1: Attachment of Umbilical cord in control group



Graph-2: Attachment of Umbilical cord in anaemic group

Control N=75		Anaemia N=75		p value
Range	Mean±SD	Range	Mean±SD	
10.4-12.3	11.45±0.57	5.9-9.6	8.06±1.09	0.0001

Table-1: Mean haemoglobin (mg/dl)

Site of attachment	Control (n=75)		Anaemia (n=75)	
	Number of cases	%	Number of cases	%
Central	53	70.67	34	45.33
Eccentric	19	25.33	37	49.34
Velamentous	0	-	2	2.67
Marginal	3	4	2	2.67
Furcate	0	-	0	-

Table-2: Site of umbilical cord attachment



Image-1: Central attachment of umbilical cord; **Image-2:** Eccentric attachment of umbilical cord



Image-3: Marginal attachment of umbilical cord; **Image-4:** Velamentous attachment of umbilical cord

attached eccentrically and 4% (3/75) of the umbilical cords were attached to the margins. No velamentous and furcate attachments were seen in this group.

In anaemic group, in 49.34% (37/75) cases the umbilical cord was attached eccentrically and in 45.33% (34/75) cases it was centrally attached. 2.67% (2/75) cases showed velamentous and marginal insertions each. No furcate attachments were seen in this group. (Table 2)

Thus, it can be concluded that in the anaemic group the placentas showed an increased tendency of eccentric attachments of the cord as compared to the control where central attachment of the cord was most common. Hence there was also an increase in marginal, velamentous and furcate attachments of the cord in the study groups when compared to the control.

DISCUSSION

Anaemic disorders of pregnancy are one of the leading causes of maternal and perinatal mortality and morbidity. These maternal disorders can have many adverse effects on the placenta and hence on the developing foetus. The foetal well-being thus, depends on a range of factors from the normal physiology of placenta, adequate supply of oxygen and nutrients during the period of gestation and in labour and delivery. Anaemia in pregnancy reduces the oxygen carrying capacity of blood and hence is known to have many deleterious effects on the placenta and baby. Of these it is established that anaemia in pregnancy is associated with a more eccentric attachment of the umbilical cord. The incidence of abnormalities like velamentous attachment of the cord are more commonly found in anaemic group as seen

in the present study.

In control group central attachment of the umbilical cord was most common seen in 53 out of 75 (70.67%) cases. Variations in attachment of the cord were rare and marginal cord insertion was the least common finding, seen in 3 (4%) cases. No velamentous or furcate attachments were seen in this group. Soni R et al⁵ and Mongia SM et al⁶ reported that in placentas from normal mothers, central cord insertion was most commonly observed. None of the case showed velamentous attachment. The findings reported by them were similar to the findings of the present study. Udainia A⁷ et al and Almasry SM et al⁸ reported that eccentric cord attachments were most common, seen in 60% cases in studies by both workers. This finding was contrary to the finding of the present study. They also found that marginal insertions were rare and least common, seen in only 1 (4%) and 2 (8%) cases respectively. No velamentous attachments were reported.

In anaemic group eccentric cord attachments were most common, seen in 37 (49.34%) cases. 2 (2.67%) cases each showed marginal and velamentous attachments and these were the least common findings. No furcate attachments were seen in this group. Mongia SM et al⁶ (2011), studied 120 placentas from anaemic mothers. They also reported that in the anaemic group the incidence of eccentric and velamentous attachments of umbilical cord increases in comparison to the controls. Soni R et al⁵ stated that eccentric cord attachments were most common in anaemic group, seen in 58% cases. In 2% cases velamentous cord insertion was seen. These findings were similar to the findings of the present study.

Robinson LK et al⁹ et al stated that variations in the site of insertion of umbilical cord were thought to be caused by a process known as trophoblast migration in which the chorionic frondosum or early placenta migrates with advancing gestation to ensure a better blood supply from a more richly vascularised area.

Strong *et al* (1993)¹⁰ revealed that the umbilical cord is normally inserted near the center of placenta. Our findings of the control group correspond to this finding. However, in the anaemic group more than half the cases collectively presented with eccentric or other abnormal forms of placental attachment.

According to Strong et al¹⁰ when the umbilical cord inserts centrally into chorionic plate of the placenta the foetal vessels are stabilized, and are thus protected from torsional and shear forces.

Donald NDS¹¹ et al studied 54 placentas and Sepulveda W et al¹² studied 825 placentas and reported 38 (70.37%) and 773 (93.69%) cases with central cord insertions respectively. The findings of Donald NDS were similar to the findings of the present study as we also found that in the control group the incidence of central cord attachment was 70.67%. Hence central cord attachment is normally the most common finding as seen by a review of data published by other authors. In anaemia we do not see similar data which further proves that the anaemia leads to changes in placental and umbilical cord

morphology.

CONCLUSION

Abnormalities in placental attachment of umbilical cord can result in various complications of pregnancy and adversely affect the foetal outcome as well. Knowledge of the variations in attachment of the umbilical cord and its correlation with maternal diseases is very significant and of extensive use to physicians as well as anatomists. Frequently abnormal cord insertions may be associated with intrauterine growth retardation, preterm labour and congenital abnormalities.

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Source of Support: Nil; **Conflict of Interest:** None

Submitted: 05-09-2020; **Accepted:** 25-09-2020; **Published:** 31-10-2020