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Original Research Article

Gross Study of Umbilical Cord and Its Anomalies

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Abstract:

Background: The umbilical cord is the lifeline between the foetus and placenta. It conveys nutrition from placenta of mother to foetus and also protects the umbilical vessels. Normally umbilical cord contains two arteries and one vein surrounded by Wharton's jelly all enclosed in a layer of amnion.

Materials and Methods: A cross sectional study was conducted on 60 consecutive umbilical cord samples collected after placental delivery from the labour room of SAT hospital and Department of Anatomy, Govt. Medical College, Thiruvananthapuram.

Results: According to our study, majority (73.3%) cases had eccentric placental attachment. Mean umbilical cord length was 45.58 cm. Preterm babies had lower mean umbilical cord length than that of term babies. There was a significant positive correlation of umbilical cord length with gestational age and birth weight. External diameter of the cord ranges from 0.30-2.30cm. Average coiling index of umbilical cord was 0.19±0.04. This index was higher for term babies than compared to preterm.

Conclusions: We concluded from the study that type of cord coiling has adverse effect on perinatal outcome. So detecting the cord abnormalities during the antenatal period using second trimester ultrasonography would be helpful in strict monitoring of foetus. Antenatal umbilical cord coiling index can be used as a promising prognostic marker for any adverse event in pregnancy.

Keywords: Umbilical Cord, Umbilical Vessels.

Introduction

"Umbilical cord" is derived from Latin word Funiculus umbilicalis. The word funiculus is derived from the Latin word "funis", meaning rope. Funiculus means "a cord like structure" [1]. Umbilical cord is a narrow cord of tissue that connects a developing embryo, or foetus, with the placenta. It is the lifeline of the foetus, and as described by Ian Donald, "the baby's life hangs by a cord". It is one of the most important part of the foetoplacental unit [2]. During intrauterine life, placenta and umbilical cord act as a connecting link, transporting essential nutrients needed for foetal growth and development, and foetal waste products between the foetus and the mother's blood. Hence an examination of the placenta and umbilical cord gives a clear idea about the intra uterine development of the foetus [3].

The umbilical cord connects the foetus with the foetal surface of placenta. Normally, at full term, one end of the cord is attached approximately to the centre of the anterior abdominal wall of the foetus, and the other end is fixed to the centre of the foetal surface of the placenta. A fully developed umbilical cord is about a 50 cm long and 2 cm in diameter [4]. At term it coils 10 -11 spirals, between foetus and placenta, and this is measured in terms of coiling index (total number of coils divided by total length of the cord in centimetres). The level of coiling of the cord is its most important anatomical feature. The cord may be straight or coiled clockwise or anticlockwise [5]. The attachment of the cord to the placental disc may be central, eccentric, marginal (battledore), via membranes (velamentous) or furcate.

Short cords can complicate pregnancies by restricting the descent of the foetus during labour. Stretching of short cords may cause obstruction of vessels leading on to foetal hypoxia. Long cords may prolapse, form knots or entangle the foetus. True knots obstruct foetal circulation. These complications may lead to increased morbidity and mortality of the foetus. Both hypo and hyper coiled cords are associated with intra uterine deaths, foetal distress, chromosomal abnormality and preterm

delivery. Abnormal placental attachments of umbilical cord are one of the causes of intrauterine death of foetus due to tear of umbilical vessels during labour. All these observation stress the significance of identifying umbilical cord defects prenatally, thereby ensuring a better prognosis not only for the baby, but for the mother as well.

In this study, my aim is to locate the site of umbilical cord attachment, detect cord abnormalities like short or long cord, hyper and hypo coiling, true and false knots to develop a better understanding of the causes of birth defects. Many obstetrically important lesions of the umbilical cord can be diagnosed prenatally.

Awareness and detection of those conditions during the antenatal period has the potential to improve foetal survival with better prenatal surveillance and timely intervention when needed. Consequently, the present study focussed on gaining knowledge on gross variations of the umbilical cord and its anomalies in our population.

Materials and Methods

The study was conducted after approval by the Human Ethics Committee, Govt. Medical College, Thiruvananthapuram.

After obtaining informed consent from the mother, gross features of umbilical cord were studied.

Sample size: Sample size was calculated with the formula:

Sample size, N=zα2 PQ/ d2 zα2= constant (3.84)

Where P=65 (64.99)

Q=100-65=35

D, precision=20% of p=13

According to the study done by Rafahady Lateef, in the article ‘"Morphological and histological study of umbilical cord at delivery". 2011 KUFA journal.

N= (1.96)2 X 65X 35/ 132=52

As per the above statistical study the minimum sample size is 52. For this study, the sample size was fixed as 60.

Sampling Method: Non –probability sampling

Inclusion Criteria: Umbilical cords of foetuses with gestational age >12 weeks

Exclusion Criteria: Specimens of umbilical cords

1. with any externally identifiable pathology
2. Of mothers with an infectious disease.
3. Of mothers with a history of taking teratogenic drugs like sodium valproate, carbamazepine, anticancer drugs, warfarin, phenytoin and isotretinoin drugs.

Study variables: The umbilical cord and its variations were studied under following headings:

1. Placental attachment
2. Length
3. Diameter
4. Presence of coiling
5. Direction of coiling
6. Coiling Index
7. Presence of knots

Data collection tools:

1. Surgical blade
2. Forceps
3. Scissors
4. Measuring tape
5. Vernier calliper
6. Camera
7. Photomicrograph

Methodology

The study was conducted after approval by the Human Ethics Committee, Government. Medical College, Thiruvananthapuram. Samples of the umbilical cord were obtained from the labour room of SAT hospital of Government Medical College, Thiruvananthapuram. A detailed gross examination of umbilical cord was done, after placental delivery. Length and diameter of the cord were measured using a measuring tape and Vernier caliper.

The umbilical cord was measured in its entirety, including the length of the placental end of the cord and the umbilical stump on the baby. The patterns of insertion (like central, marginal, eccentric) of the umbilical cord on the placenta were recorded. The number of complete coils or spirals was counted from the neonatal end towards the placental end of the cord. Depending upon the direction of the course of the vessels, umbilical cord's coiling pattern was recorded. The number of knots on the cord were counted and recorded.

Data Analysis: The data collected was entered in to a personal computer using the computer package Microsoft Excel work sheet. The analysis of data was done by using version 16 of statistical package for the social sciences (SPSS) software. Suitable statistical analysis was performed to elucidate the results of the study.

Quantitative variables were analyzed using mean and standard deviation and the statistical test used was Analysis of variance (ANOVA). Categorical variables were analyzed using proportion and the statistical tests used were Pearson’s, Chi-square test and Fishers test. P-value of <0.05 was considered significant.

Results

Out of 60, 59 were collected from live foetuses and one from a dead foetus. Out of 60 mothers, 32 (53.3%) were primi parae. 6 (10%) of these women had diabetes mellitus, 1 had preeclampsia and 2 anemia, 14 (23.3%) had preterm delivery. 54 delivered vaginally while 6 women delivered by LSCS.

Age of the mothers: Out of 60 mothers, the mean age was found to be 24.85 years ± 4.25. Minimum age was 18 and maximum was 37 years of age. Highest frequency (38.3%) belonged to the age group 21-25 years. There were no significant findings between maternal age and other study variables

Gestational age: In the sample studied, the mean gestational age was 37.67 ± 3.18 weeks. Minimum gestational age was 17.1 weeks and maximum was 40.1 weeks. Highest frequency (90%) belonged to the gestational age group 35 - 40 weeks.

Relation of Gestational Age with Length, External Diameter and Coiling Index of Umbilical Cord: The mean umbilical cord length for preterm babies was lower than that for term babies. According to the results obtained, there was a statistical significance in the relationship of the umbilical cord length with gestational period (P<0.024).

Regarding the cord diameter, the mean diameter for both term and preterm babies were same. There were no statistical significance (P>0.05), on comparing it with gestational age.

The mean coiling index for term babies was higher than that of preterm babies. A statistically significant value (P< 0.02) was obtained on comparing gestational age and mean coiling index.

Table 1: Relation of gestational age with length, diameter and coiling index of umbilical cord

	N (60)	Mean umbilical cord length (cm) (SD)	Mean umbilical cord diameter (cm) (SD)	Mean coiling index (SD)
Preterm babies	14	44.67 ± 6.57	1.89 ± 0.27	0.195 ± 0.045
Term babies	46	45.58 ± 7.64	1.89 ± 0.26	0.198 ± 0.042

Sex of the baby: Various parameters measured were compared in both male and female babies and the differences were noted.

Relation between umbilical cord dimensions and sex of the babies: The length and diameter of the cords were compared in both sexes. The mean umbilical cord length for females was slightly lower than that for males and mean umbilical cord diameter of the males was slightly lower than that for females. There was no significant statistical difference in these parameters between both sexes; (P> 0.05).

Table 2: Umbilical cord measurements of both sexes

Sex of the baby	N	Mean umbilical cord length(cm) (SD)	Mean diameter of the cord (cm) (SD)
Male	38	45.58 ± 7.64	1.86 ± 0.26
Female	22	44.71 ± 7.07	1.95 ± 0.16

Gross Features of Umbilical Cord: Length, external diameter and coiling index of umbilical cord were measured. Coiling manner, presence of knots and placental attachments of the umbilical cord were also noted. Number of umbilical vessels at the cut surface of cord was observed.

Table 3: Gross measurements of the umbilical cords

Parameter	Minimum (cm)	Maximum (cm)	Mean	Standard deviation
Total length	15	65	45.58	7.64
External diameter	0.3	2.3	1.89	0.26
Coiling index	0.02	0.25	0.19	0.04

Length of umbilical cords: Out of 60 cases studied, 4 had short cords (< 30 cm). There were no cases with long cords (> 70 cm). The average length of umbilical cords in the study population was 45.58cm. The length of the umbilical cord ranged from 15 cm to 65 cm in the cases studied. An umbilical cord length less than 30 cm was found in 3.33% (N=4) cases, of which one foetus had a gestational age of 17.1 weeks.

Relation between length of the umbilical cord and gestational age: There was a significant (p<0.000) positive correlation between the gestational age and the length of umbilical cord (Pearson correlation = 0.505). This showed that length of umbilical cord increases with an increase in gestational age.

Table 4: Relation between length of the umbilical cord and gestational age

Gestational age (weeks)	Frequency	Umbilical cord length (cm)	Mean umbilical cord length (cm) (SD)
<20	1	15	15
20 – 25	0	0	0
25 – 30	0	0	0
30 – 35	4	33 – 46	39.75±5.31
35 – 40	54	28 – 65	46.69±6.43

There is a significant (p< 0.019) positive correlation between birth weight of foetus and the length of umbilical cord (Pearson's =0.433). This shows that length of the umbilical cord increases with increase in birth weight.

Table 5: Relation between birth weight and length of the umbilical cord

Birth weight (kg)	Frequency	Umbilical cord length (cm)	Mean umbilical cord length (cm) (SD)
0 – 0.5	1	15	15
0.5 – 1	0	0	0
1 – 1.5	0	0	0
1.5 – 2	3	33 - 46	39.67 ± 6.51
2 – 2.5	16	35 - 50	45.19 ±4.28
2.5 – 3	23	28 – 62	45.91 ±7.48
3 – 3.5	15	38 - 65	48 ±6.79
3.5 – 4	2	48 - 54	51 ± 4.24

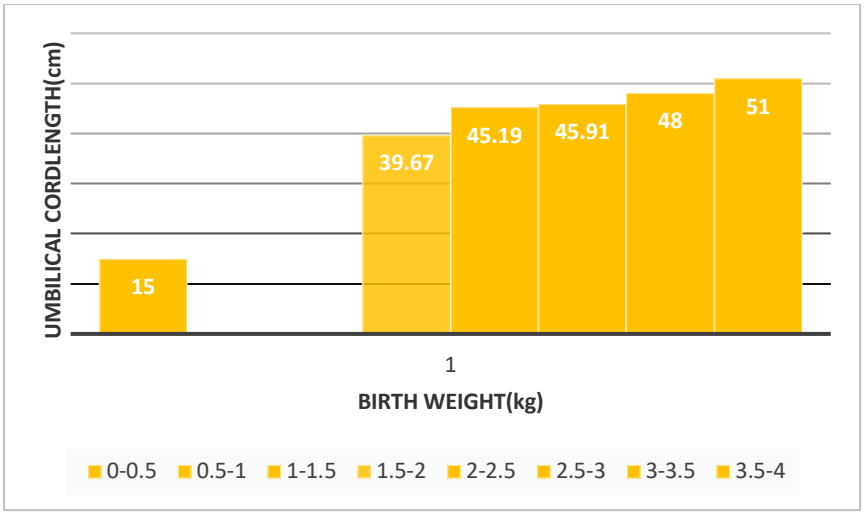

Figure 1: Clustered bar graph showing relation between birth weight and length of the umbilical cord

External diameter of the cord: The external diameter of the cord was compared with parameters like gestational age and birth weight. The average external diameter of the cord was 1.89 cm ± 0.26. The minimum cord diameter was 0.30 and maximum was 2.30 cm.

Table 6: Relation between gestational age and external diameter of the cord

Gestational age	Frequency	Umbilical cord diameter (cm)	Mean umbilical cord diameter (cm) (DM)
<20	1	0.3	0.3
20 – 25	0	0	0
25 – 30	0	0	0
30 – 35	4	1.8 – 2	1.87±0.10
35 – 40	54	1.5 – 2.3	1.92±0.16
>40	1	2	2

Relation between gestational age and external diameter of the cord: There was a significant (p=0.000) positive correlation between the gestational age and the external diameter of the umbilical cord (Pearson's r = 0.714). There was proportionate increase in diameter of the cord with the gestational age.

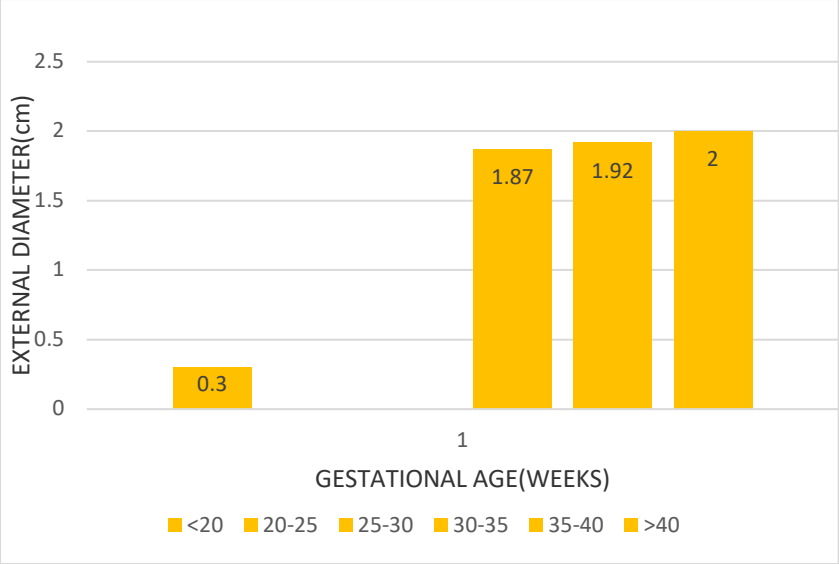

Figure 2: Bar graph showing relation between gestational age and external diameter of the cord

Relation between birth weight and external diameter of the cord: On comparing birth weight and external diameter of the cord, it was observed that there was no significant positive correlation between them.

Table 7:

Low birth weight	N	Diameter in cm		P
		Mean	SD	
Yes	17	1.81	0.43	0.130
No	43	1.93	0.15	

3.4.3 Type of coiling: Out of the 60 cords, 70 % (N=42) had normal coiling, 21.7% (N =13) had hypo coiling and 8.3 % (N= 5) had hyper coiling. The average coiling index was 0.19± 0.04. The minimum coiling index was 0.02 and maximum was 0.33.

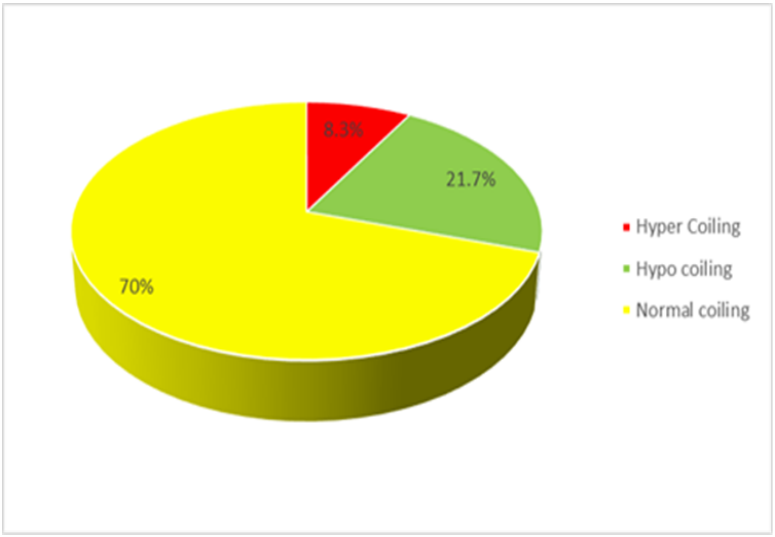

Figure 3: Pie chart showing distribution of coiling

Relation between gestational age and coiling index of umbilical cord: There was a significant (p= 0.001) positive correlation between the gestational age and coiling index of umbilical cord. Out of 14, 61.5% of subjects with hypocoiled cords had preterm delivery. In subjects with normo coiled cords the incidence of preterm delivery was 2.4 % and in hyper coiled group it was 100%. The relationship of hypercoiled and hypo coiled cord with preterm delivery was significant (p value <0.001) whereas this association in normo coiled cord was statistically insignificant.

Table 8: Relation between pre-term deliveries and type of coiling

Coiling of the umbilical cord	Pre term			
	Yes		No	
	N	%	N	%
Hyper coiling	5	100.0	0	0.0
Hypo coiling	8	61.5	5	38.5
Normal coiling	1	2.4	41	97.6

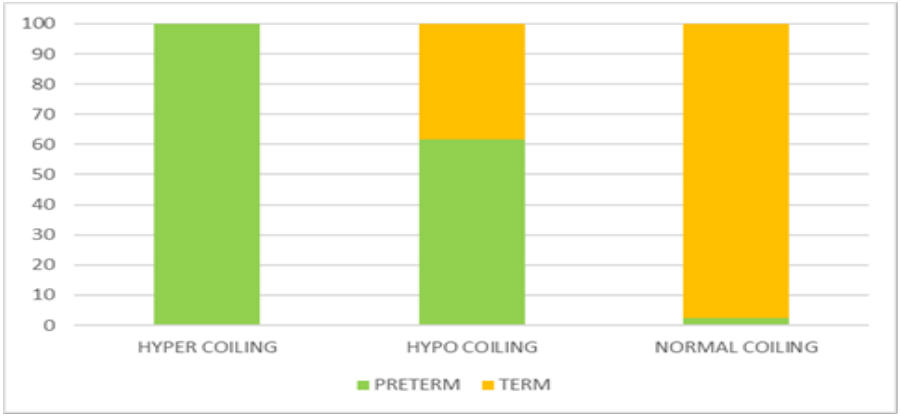

Figure 8: Stacked bar graph showing relation between pre-term deliveries and type of coiling

Relation between gestational age and type of coiling: On doing ANOVA test, significant difference was found between different types of coiling (hypercoiling, hypocoiling and normo coiling) and gestational age of foetus. Further on doing post Hoc test with Bonferroni correction, the difference in gestational age was found to be significant between umbilical cords with hypercoiling and normocoiling, and between umbilical cords with hypocoiling and normocoiling.

Thus the study found that foetuses with hypercoiling and hypocoiling umbilical cords had high risk of preterm deliveries.

Table 9: Relation between gestational age and type of coiling

Coiling of umbilical cord		Mean difference	Std. error	Significance
Hypercoiling	Hypocoiling	0.48	1.43	1
Hypercoiling	Normocoiling	-3.35	1.28	0.035
Hypocoiling	Normocoiling	-3.83	0.86	0.001

Relation between birth weight and type of coiling of umbilical cord: Significant ($p < 0.001$) positive correlation between birth weight of the foetus and coiling of umbilical cord was observed. Out of 17, 92.3 % of subjects with hypocoiled cords had low birth weight. In subjects with normocoiled cords the incidence of low birth weight was 2.4 % and in hypercoiled group it was 80%.

Hypo coiled and hypercoiled cords had significant association with low birth weight ($p<0.001$).

Table 10: Relation between birth weight and type of coiling of the umbilical cord

Type of coiling	Low birth weight			
	Yes		No	
	N	%	N	%
Hyper coiling	4	80.0	1	20.0
Hypo coiling	12	92.3	1	7.7
Norma coiling	1	2.4	41	97.6

Relation between birth weight and type of coiling of the umbilical cord: On doing test of ANOVA, significant difference were found between umbilical cord with different types of coiling (hyper coiling, hypo coiling and norma coiling) and birth weight of babies. Further on doing post Hoc test with Bonferroni correction, the difference in birth weight was found to be significant between umbilical cords with hyper coiling and normo coiling, and between hypo coiling and normo coiling.

Thus the study found that hyper coiled and hypo coiled umbilical cords had significant association with low birth weight babies.

Table 11: Relation between birth weight and type of coiling

Coiling of umbilical cord		Mean difference	Standard error	Significance
Hyper coiling	Hypo coiling	0.16	0.21	1.00
Hyper coiling	Norma coiling	-0.78	0.19	0.001
Hypo coiling	Norma coiling	-0.94	0.13	0.001

Coiling Direction: Out of 60 cases, 91.7% (N=55) had anticlockwise coiling and 8.3% (N=5) had clockwise coiling.

Table 12: Coiling direction

Coiling manner	Frequency	percentage
Clockwise	5	8.3
Anticlockwise	55	91.7
Total	60	100

Placental attachment of umbilical cord: Out of the 60 cases, 73.3% cases (N= 44) presented with eccentric insertion, 15% cases (N =9) presented with central insertion of the cord and 10 % cases (N= 6) presented with marginal insertion of the cord. Furcate insertion was present in 1.7% case (N=1).

Figure 9: Central insertion of umbilical cord on placenta

Figure 10: Eccentric insertion of umbilical cord on placenta

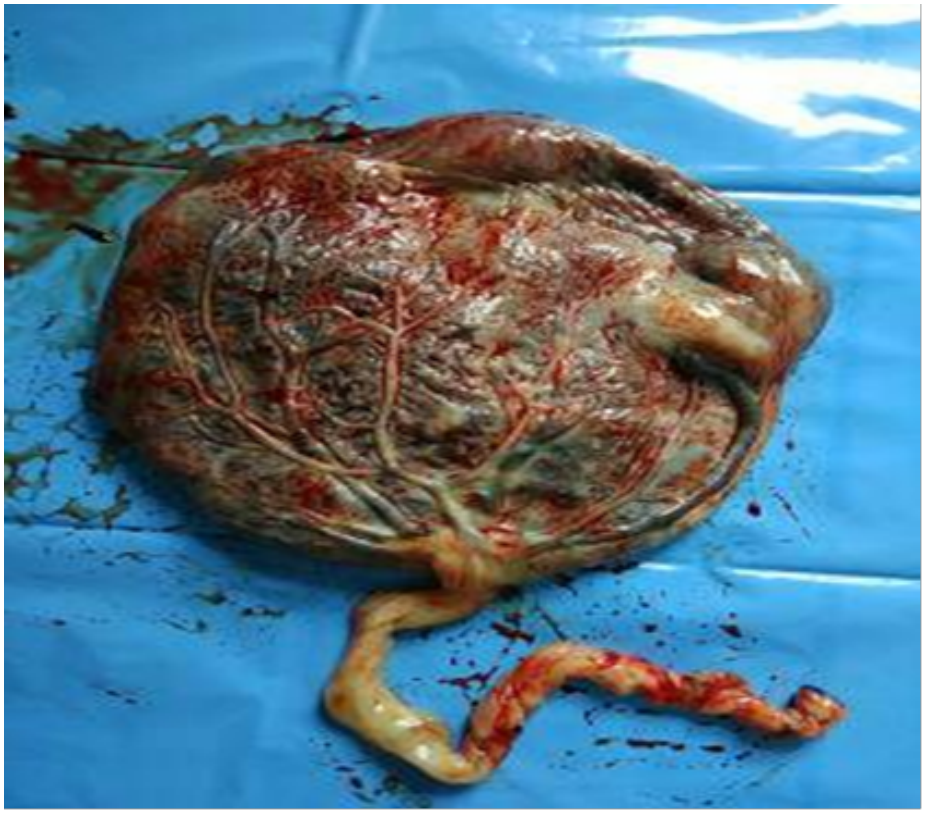

Figure 11: Marginal insertion of umbilical cord on placenta

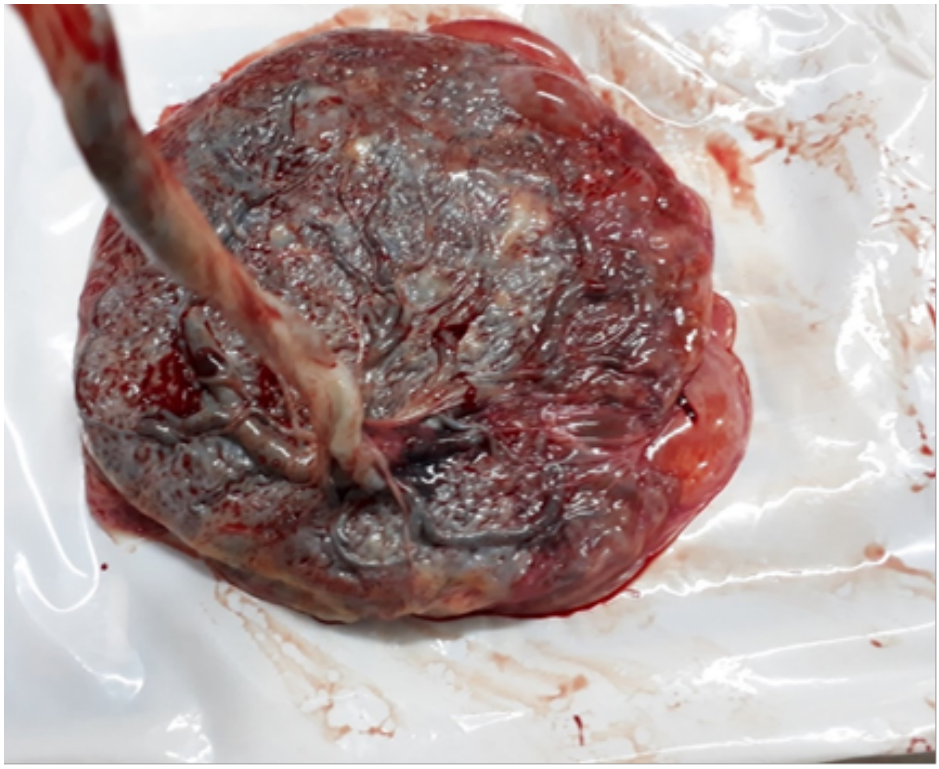

Figure 12: Furcate insertion of umbilical cord on placenta

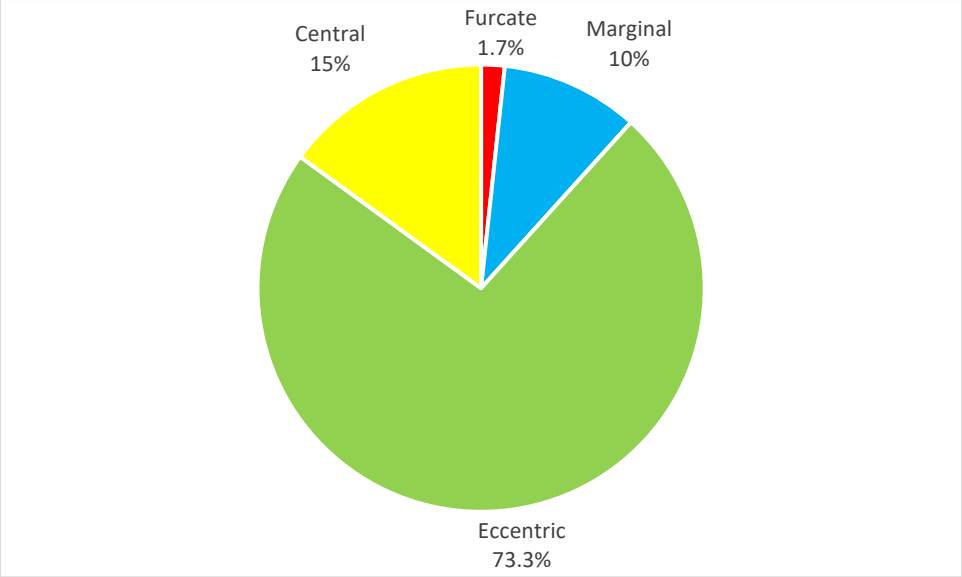

Figure 13: Pie chart showing placental attachment of umbilical cord

Relation between birth weight, mode of delivery and placental attachment of umbilical cord: There were no significant positive correlation between placental attachment of umbilical cord and birth weight or mode of delivery ($p>0.05$).

Knots of the umbilical cord: In this study only five umbilical cords showed false knots. There were only one false knots on each cord. No true knots were observed.

Figure 14: Showing umbilical cord with false knot

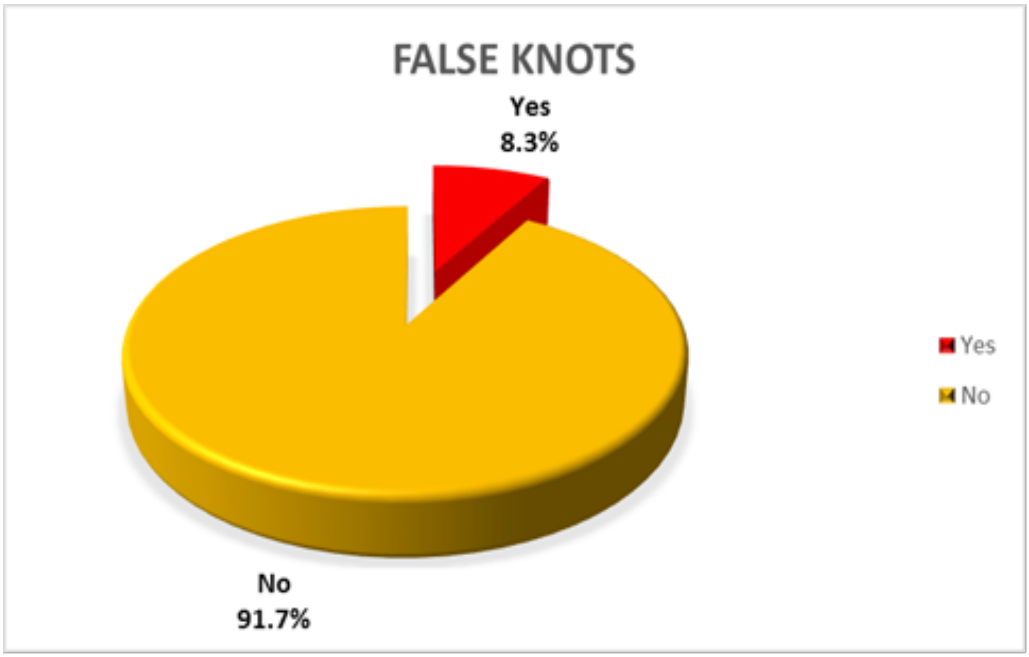

Figure 15: Pie chart showing distribution of false knots

Discussion

The umbilical cord is a trivascular conduit, which allows the foetal blood to flow to and from the placenta. The umbilical cord is vital to the development, well-being, and survival of the foetus, but is vulnerable to kinking, compressions, traction and torsion which may affect the perinatal outcome. Several gross umbilical cord lesions are known to obstruct umbilical blood flow.

These include true knot, long cord, hyper coiled and hypo coiled cords, narrow cord with decreased Wharton's jelly, and abnormal cord insertion. In the present study, the association between gross cord abnormalities and intrapartum complications are analysed, and a strong association between them confirmed.

Length of the cord: The average length of the umbilical cord in the present study was 45.58 cm ± 7.64. The mean umbilical cord length was 15 cm in <20 weeks, 39.75 cm in 30-35 weeks, 46.69 cm in 35- 40 weeks and 40 cm in > 40 weeks of gestation. The length of the umbilical cord ranged from 15 cm to 65 cm. An umbilical cord length of less than 30 cm was found in only 3.33% cases (N=2). In the present study as well as in studies by C.W. Walker (1960) [6], Agboola (1978) [7] and Adinma (1993) [8], it was found that there is no correlation between cord length and maternal age.

According to Purola (1968) [9] the cord length of infants with birth weight more than 2500 grams is 22-130 cm.

Table 13: Comparison of umbilical cord length from other studies

Author	Study population	Cord length (cm)	Mean cord length (cm)(SD)
Ibrahim Elarbah et al. (2012) [10]	131	31 - 130	59.2 ± 16.2
Shunji Suzuki and yukiko fuse(2012) [11]	11,029	19 - 133	56.2±11.7
Sreekumar Rajasekharan (2017) [12]	110	4 - 56	25.91 ± 1.12

In our study, there was a significant positive correlation between the gestational age, birth weight and the length of the umbilical cord.

It showed that the length of the umbilical cord increases with increase in gestational age and birth weight. This result was in accordance with studies done by Ibrahim Elarbah et al. (2014), shunji Suzuki et al. (2012) and Sreekumar Rajasekharan (2017).

External diameter of the cord: The average external diameter of the umbilical cord in the present study was 1.89 cm ± 0.26with a range of 0.3 – 2.30 cm. The mean external diameter of umbilical cord was 0.3 cm in <20 weeks, 1.87 cm in 30-35 weeks, 1.92 cm in 35- 40 weeks and 2cm in > 40 weeks of gestational age. According to Susan Standring [4], the normal external diameter of the umbilical cord is 1- 2 cm.

Table 14: Comparison of external diameter of umbilical cord with other studies

Author	Study population	External diameter (cm)	Mean external diameter
C.S.Abaidoo et al. (2008) [13]	124	1.50 – 3.20	2.1
Rohinidevi M et al. (2016) [14]	50	1.2 – 1.7	1.5
Morteza Tahmasebi and Reza Alighanbari (2018) [15]	223	0.66 – 2.36	1.54
Sabnis A.S et al.(2012) [16]	74	0.9 – 2.4	

Present study is in concordance with the studies done by Morteza Tahmasebi and Reza Alighanbari, Sabnis A S et al. and C.S.Abaidoo et al.

In our study, there was a significant positive correlation between the gestational age and external diameter of the cord, similar to the findings of Phaloprakaran [17], Sreekumar Rajasekharan.

Phaloprakaran et al. (2004) stated that there was a strong correlation between umbilical cord diameter and gestational age. There was no correlation between umbilical cord diameter and birth weight. Sreekumar Rajasekharan (2017) [12] observed that the diameter of the umbilical cord increases with an increase in foetal age.

Type of Coiling and coiling index of umbilical cord: Out of 60 cases, 42 had normo coiling, 13 had hypo coiling and 5 had hyper coiling. The average coiling index of the umbilical cord was 0.19 ± 0.04. In the present study, there was no relationship between umbilical coiling index and maternal age or parity, but low birth weight babies and preterm deliveries were associated with hypo - coiled and hyper - coiled cords.

Table 15: Comparison of type of coiling and coiling index of umbilical cord with other studies

Author	Study population	Coiling index	Norma coiling	Hypo coiling	Hyper coiling
Saswati Tripathy (2012) [18]	102	0.20±0.8	81	11	10
Shayesta Rahi and Gulshan Akther(2017) [19]	100	0.2	80	10	10
Ercal T et al. (1996) [20]	147	0.2	87	30	

The findings of this study agrees with the findings of Saswati Tripathy (2012), Shayesta Rahi, Gulshan Akther (2017) and Ercal T et al. (1996)

In the present study, 17 out of the 60 cases were found to have low birth weight. 80% (4) of the babies with hyper - coiled cord, 92.3% (12) with hypo - coiled cord and 1 having a normo - coiled cord had low birth weight. 14 babies were preterm. Out of 14 preterm deliveries, 5 had a hyper - coiled cord, 8 hypo - coiled and 1 a normo - coiled cord. There was a significant association between hypercoiled/ hypo - coiled umbilical cords with preterm deliveries and low birth weight babies. De Laat and Nikkels (2006) [21] have also observed that both hyper - coiled and hypo - coiled umbilical cords were associated with preterm deliveries.

Ms. Afrinbanu Dyawapur (2016) [1] concluded that there is a significant correlation between umbilical cord coiling index and perinatal outcomes. He also noted that both hyper - coiled, hypo - coiled cords had a significant association with low birth weight.

Shayesta Rahi and Gulshan Akther (2017) [19] observed hyper-coiled cords associated with low birth weight and IUGR.

Sakshi Agarwal et al. (2014) [22] found that hyper - coiling was significantly associated with low birth weight and IUGR, whereas hypo - coiling was associated with low apgar score, meconium staining and NICU admissions.

Enas Adnan Abdulrasul (2014) [23] noticed low birth weight babies were found to have a significant association with hypo - coiling but not with hyper-coiling.

T.Chitra et al. (2012) [24] found a significant association between preterm labour and hypo - coiled cord.

Direction of coiling: The direction of coiling of umbilical cord in our study was found to be predominantly anticlockwise (91.7%).

Shalu Gupta et al. (2006) [25] observed that anticlockwise coiling was seen in 82% cases and clockwise coiling in 17.8% cases. They suggested that the predominance of anticlockwise twists may be the result of forceful paddling with right arm of a foetus who has already established handedness, or the cord twist may be the result of either active or passive rotation of the foetus.

Our study is in concordance with study done by Shalu Gupta et al [25], Snoor Jalal Mustafa [26], Rohinidevi M et al [14]. and Poonam Bhojwani [5].

Placental attachment of umbilical cord: In the present study, it was observed that umbilical cords were commonly positioned eccentrically on placentae. A central cord insertion was found in 15% cases (N=9), eccentric and marginal insertion in 73.3% (N=44) and 10% (N=6) cases respectively. Furcate cord insertion was seen in 1.7% (N=1) cases. There were no association

between either mode of delivery or foetal birth weight with placental attachment of umbilical cord.

Table 16:

Author	Study population	Central	Eccentric	Marginal	Furcate	Velamentous
T.Jeyasingh et al. (2016) [27]	50	11(22)	35 (70)	4 (8)	0	0
N.K. Arora et al. (2016) [28]	32	5 (15.62)	19(59.38)	6 (18.75)	1 (3.12)	1 (3.12)
Ankit jain et al. (2017) [3]	70	42 (60)	19(27.14)	9 (12.86)	0	0
Asra Anjum et al. (2015) [29]	50	38	54	6	0	2

The results of the present study are in concordance with studies done by Asra Anjum et al., T.Jeyasingh et al., N.K.Arora et al. and Alka udainia et al

Umbilical cord knots: In the present study, five of the umbilical cords showed false knots. No true knots were observed in any of the cords.

C.S.Abaidoo et al. (2008) [13] found knot formation in five umbilical cords and four of these knots were false.

Rohinidevi M et al. (2016) [14] observed 32% false knots in 50 placentae.

Bohiltea re et al. (2016) [30] reported that 4 umbilical cords had false knots and 16 had true knots. The cases were diagnosed with antepartum ultrasonography

Conclusion

Thus from the present study, we concluded that hyper or hypo - coiling cord has adverse perinatal outcomes like spontaneous preterm labour, low birth weight and chromosomal anomaly. Therefore, ultrasonographic evaluation of the umbilical cord parameters during anomaly scan is very important and we suggest that it should be routinely measured along with other foetal parameters. Timely recognition of any abnormality is needed for a safe pregnancy and the delivery of a healthy baby. The challenge should be taken up, and newer equipment and strategies should be developed to analyse and avoid cord complications.

This would decrease the incidences of perinatal morbidity and mortality due to cord complications and help in realizing the expectations for the delivery of a healthy baby, in the future.

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