ORIGINAL ARTICLE

CORRELATION OF LENGTH OF UMBILICAL CORD WITH FETOMATERNAL OUTCOMES IN TERM PREGNANCIES

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ABSTRACT

Objective: To determine the association between umbilical cord length and feto-maternal outcomes in term pregnancies

Materials and Methods: This cross-sectional study was carried out at Khyber Teaching Hospital Peshawar Pakistan from March 2023 to September 2023 involving 153 pregnant women aged 18-40 with a fetus of 37 to 42 weeks of gestation and with spontaneous labor. Labor was monitored using a partogram and frequent fetal heart rate auscultation. Abnormal fetal heart rate was detected on CTG. Fetal cord length was measured and categorized into long, normal, and short cords. Maternal and fetal outcomes were noted. Data analysis was performed using SPSS version 23 and the Chi-square test with a p-value of ≤ 0.05 was considered significant.

Results: The study found that the mean maternal age was 29.30±8.48 years, the mean gestational age was 38.098±4.19 years, and the mean cord length was 53.75 ± 21.79 cm. The majority of cases were in the normal cord category (72.55%), followed by long cords (17.65%) and short cords (9.8%). Abnormal APGAR score was observed in 4.5%, 40%, and 25.9% of infants in normal, short, and long cords groups respectively. Stillbirths were observed in 4.6%, 26.67%, and 18.52% of infants in normal, short, and long cords groups respectively. Normal vaginal deliveries were observed in 87.38%, 53.33%, and 62.97% of mothers with infants in normal, short, and long cords groups respectively, while forceps delivery was performed in 5.4%, 2%, and 7.4% in normal, short, and long cords groups respectively. Cesarean section was performed in 16.22%), 26.67%, and 29.63% of mothers with infants in normal, short, and long cords groups respectively.

Conclusion: The current study concludes that there is an association between umbilical cord length and fetal outcome. With abnormal umbilical cord length, the possibility of fetal asphyxia i.e., decreased APGAR score and fetal mortality increases. However, the umbilical cord length is not significantly associated with maternal outcomes.

Key Words: Apgar score, Feto-maternal outcome, Umbilical cord

This article may be cited as: Akhtar N, Ghayur MS, Bangash AG, Akhtar Z, Samad A, Riaz S. Correlation Of Length Of Umbilical Cord With Fetomaternal Outcomes In Term Pregnancies. J Med Sci 2024 July-September;32(3):276-280

INTRODUCTION

The umbilical cord serves as a connection between the fetus and the placenta. It is the exclusive pathway for the passage of materials between the mother and the fetus. It grows from the remains of the yolk sac and allantois. [1] It has several critical roles, including providing oxygen-rich blood and nutrients to the fetus. [2] It also transports waste materials and deoxygenated blood from the fetus to the maternal circulatory system, where they can be eliminated. [3] The cord ranging in length from 40 to 300 cm, ensures safe movement for the infant without harming the cord or placenta. Usually, an umbilical cord is considered short when it is less than 30 centimeters in length while a long umbilical cord is more than 70 cm in length. [4]

Umbilical cords may be extremely long or short. These differences have generated concerns about their possible influence on fetal well-being and growth. [5] Research studies have looked into the link between the length of the umbilical cord and fetal development.

Too long cords are possibly linked to a higher possibility of fetal growth retardation since the excessive length of the fetal cord might impede blood supply to the fetus. [6] On the other hand, too short cords could hinder fetal activity and perhaps impair fetal development. However, the relationships discovered in these investigations aren't constantly constant, and other factors, such as the existence of knots in the cord, might play an important part in fetal development.

Cord constriction can cause fetal distress, which is characterized by abnormalities in the fetal heart rate and blood oxygen levels. [7-9] Fetal distress can be a serious

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Date Received: 16/05/2024
Date Revised: 22/08/2024
Date Accepted: 02/09/2024

problem at delivery, necessitating emergency procedures like an emergency cesarean section. Umbilical cords may develop true knots that are knots in the cord body. True knots occur more frequently in longer cords and may increase the danger of cord compression. [10, 11] Short umbilical cords are also related to a delay in the second stage of labor and negative obstetrical outcomes such as congenital abnormalities and mortality.

Similarly, extended umbilical cords are linked to higher birth weight, poor newborn outcomes, low Apgar scores, and cord entanglement. [12] Research reported a relationship between the length of the umbilical cord showing that short umbilical cords were related to poor Apgar score in 30.64% of babies and stillbirth in 11.29% of babies, and long umbilical cords have been linked with low Apgar score in 23.89%of babies and stillbirth in 12.57% of babies. [4]

There is a scarcity of evidence available in our population on the association between umbilical cord length and feto-maternal outcomes. This study aims to explore the association between umbilical cord length and unfavorable obstetric outcomes in our population. This may help the obstetricians to anticipate the complications associated with umbilical cord length to prevent newborn problems.

MATERIAL AND METHODS

This cross-sectional study was carried out in the Department of Obstetrics and Gynecology, Khyber Teaching Hospital, Peshawar from March 2023 to September 2023 including 153 pregnant ladies. The sample size was calculated with the help of the Raosoft sample size calculator using the frequency of stillbirth in 11.29% of neonates with short umbilical cords, taking the confidence level 95%, and margin of error 5 %. [12]

Pregnant women in the age range of 18 to 40 years with 37-42 weeks gestation having singleton fetuses in spontaneous labor presented to the labor room were included in the study. Women with ruptured membranes, with congenital fetal defects, with multiple pregnancies, and those having any chronic comorbidities were excluded from the study.

The course of labor has been monitored using a partogram. Frequent auscultation was used for fetal monitoring during labor. All women with abnormal fetal heart rates were monitored on CTG for any abnormal findings. Reduced baseline variations, prolonged tachycardia, fluctuated deceleration, and late decelerations were all considered signs of fetal distress and required immediate delivery. Following the birth of the fetus, the chord was clamped on twice and divided in the center. The length of the cord was measured from the fetal umbilicus to the cut end (1st part) and from the cut end to the placenta (2nd part) using measuring tape. Both the measures were added to each other.

All the cases were categorized as long, normal, and short according to the length of the cord in centimeters as follows; the short chord group contained cases with lengths less than 30 cm, regular lengths from 30 to 70 cm, and long cords with lengths between more than 70 cm. Maternal outcomes like the mode of delivery (normal vaginal, forceps delivery, and C-section delivery) and fetal outcomes like APGAR score at 1 minute and stillbirth were also noted in each case. Fetal ICU admissions were also noted in all patients. SPSS version 23 was used for data analysis. The chi-square test was applied to the data obtained keeping a p-value of ≤ 0.05 as significant.

RESULTS

In this study, the mean maternal age was 29.30±8.48 years, the mean gestational age was 38.098±4.19 years, and the mean cord length was 53.75 ± 21.79 cm. The cord length ranged from 24 to 150 cm. In maximum cases, 111 (72.55 %), having cord length between 30-70 cm were in the normal length category, followed by 27 (17.65 %) cords in length more than 70 cm i.e., long cords category while the remaining 15(9.8%) cords fall in short cord category (Figure 1).

The mean APGAR score observed was 6.15±3.099. Of the total 111 infants with normal umbilical cords, 5 (4.5%) had APGAR scores of less than 6 while 106 (95.5%) had APGAR scores≥6. In the long cord group with a total of 27 infants, 7 (25.9%) had APGAR scores of less than 6 while 20 (74.1%) had APGAR scores≥6. In the short cord group having 15 infants, 6 (40%) had APGAR scores less than 6 while 9 (60%) had APGAR scores≥6.

The p-value was 0.000014, which was significant. Stillbirths were observed in 4 (3.6%), 4 (26.67%), and 5 (18.52%) infants in normal, short, and long umbilical cord groups respectively using a Chi-Square test with a p-value of 0.00131 which was significant (table 1).

Regarding maternal outcomes normal vaginal deliveries were observed in 87 (78.38%), 8 (53.33%), and 17 (62.97%) mothers in infants with normal, short and long

Table No 1: Fetal Outcomes (APGAR scores and Stillbirths) to Cord Length

Cord length	APGAR score < 6		APGAR score ≥ 6		p value	Still birth		Live birth		p value
Normal	5	4.5%	106	95.5%		4	3.6%	107	96.4%	0.00131
Short	6	40%	9	60%		4	26.67%	11	73.33%	
Long	7	25.9%	20	74.1%		5	18.52%	22	81.48%	
Total	18	11.77%	135	88.23%		13	8.5%	140	91.5%	

Table No 2: Maternal outcome

Cord length	Normal vaginal delivery		Forceps delivery		Cesarean section delivery		p value
Normal	87	78.38%	6	5.4%	18	16.22%	0.094011
Short	8	53.33%	3	2%	4	26.67%	
Long	17	62.97%	2	7.4%	8	29.63%	
Total	112	73.20%	11	7.20%	30	19.60%	

Table No 3: NICU admissions

Cord description	NICU admissions		No NICU admissions		p value
Normal length	9	8.1%	102	91.89%	0.079519
Short length	4	26.67%	11	73.33%	
Long length	4	14.81%	23	85.18%	
Total	17	11.11%	136	88.89%	

umbilical cords groups respectively, forceps delivery were performed in 6 (5.4%), 3 (2%), and 2 (7.4%) mothers in infants with normal, short and long umbilical cords groups respectively while cesarean sections were performed in 18 (16.22%), 4 (26.67%) and 8 (29.63%) mothers in infants with normal, short and long umbilical cords groups. The p-value calculated was 0.094011 which was not significant (Table 2).

Nine (8.1%) infants in the normal cord group, 4 (26.67%) infants in the short cord group, and 17 (11.11%) infants in the long cord group were admitted to ICU due to fetal distress. The p-value calculated was 0.079519 which was not significant (Table 3).

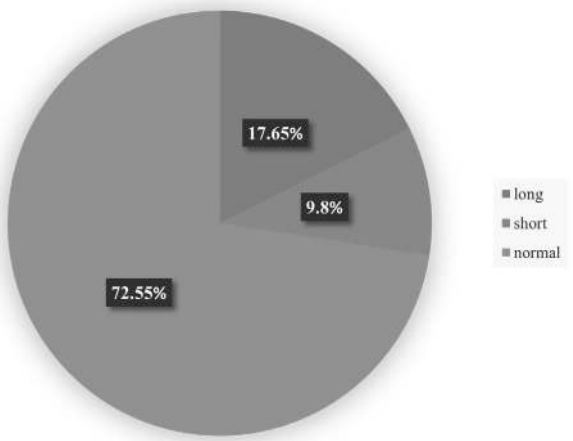

Fig 1: Length-wise distribution of umbilical cords

DISCUSSIONS

The mean gestational age in our study was 38.098±4.19 weeks which is comparable with a study by Njoku CO et al, whose study participants' mean gestational age was 38.94 ±1.326 weeks. [1] This is due to the reason that both of the studies have included term pregnancies. The umbilical cord widely varies in length. At birth, the mature cord is around 50-60 cm long and 12 mm in diameter. A long cord is more than 70 cm long, whereas a short cord is less than 30 cm long. Cord length can range from no cord to 300 cm.[13,14] In our study we observed the mean cord length of 53.75 ± 21.79 cm. In a study by Suzuki Set al. the average cord raged between 60–70 cm and in a study by Shiva Kumar HC et al the average length of the cord was between 61 and 70 cm. [1, 15] The results of this study and our study is comparable. The slight difference in results about cord length is because these studies have larger sample sizes compared to our study.

The incidences of normal, short, and long cords in our study were 72.55 %, 17.65 %, and 9.8% respectively. The incidence of the short cord was 5.9% in a study by Balkawade et al[17] and 7.2% in a study by Adesina et al.[18] In another study normal cords were observed in 80.0% of

cases and long cords were observed in 12.3% of cases. [1] These results of all studies and our results are comparable.

In this study, the total cases having an Apgar score <6 at 1 minute, were 11.77% cases. Out of these, 4.5%, 40%, and 25.9% of cases were found in normal, short, and long cord groups respectively and 30.64 % were in long cord groups. Both short and long cords were significantly associated with lower-than-normal APGAR scores. Similar results were found by Shafqat T et al in their study who observed 15.20% cases in the short cord group and 30.64 % cases in the long cord group. [4]

In our study, cesarean section was performed in 16.22%, 26.67%, and 29.63% of mothers having infants with normal, short, and long umbilical cord groups respectively. Normal vaginal deliveries were observed in 78.38%, 53.33%, and 62.97%) of mothers in infants with normal, short and long umbilical cords groups respectively, forceps delivery was performed in 5.4%, 2%, and 7.4% of mothers in infants with normal, short and long umbilical cords groups.

However, these observations were not statistically significant. Kulshrestha K et al observed that C-section was needed in 59.11%, 18.23%, and 22.64% of mothers having infants with normal, short, and long umbilical cords groups' respectively while no mother delivered through forceps delivery. They also observed that 8.84% of cases in the short cord group, 84.8% in the normal cord group, and 6.35% in the long cord group were delivered through normal vaginal delivery. [3]

In the current study, 8.1% of infants in the normal cord group, 26.67% of infants in the short cord group, and 11.11% of infants in the long cord group were admitted to NICU due to fetal distress but the observations were not statistically significant. These observations were also not statistically significant. Shafqat T et al. in their study observed that 1.23% in the normal cord group, 20.96% in the short cord group, and 15.72% in the long cord group needed NICU admissions. [4]

CONCLUSION

The current study concludes that a positive association between umbilical cord length and fetal outcomes exist. With abnormal umbilical cord length, the possibility of fetal asphyxia i.e., decreased APGAR score and fetal mortality increases. However, the umbilical cord length is not significantly associated with maternal outcomes, such as mode of delivery.

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CONFLICT OF INTEREST: Authors declare no conflict of interest

GRANT SUPPORT AND FINANCIAL DISCLOSURE: NIL

Authors Contribution:

Following authors have made substantial contributions to the manuscript as under

Authors	Conceived & designed the analysis	Collected the data	Contributed data or analysis tools	Performed the analysis	Wrote the paper	Other contribution
Akhtar N	✓	×	✓	×	✓	×
Ghayur MS	✓	✓	×	✓	✓	×
Bangash AG	×	✓	×	×	✓	×
Akhtar Z	✓	✓	✓	×	✓	✓
Samad A	✓	✓	×	✓	✓	×
Riaz S	×	✓	×	×	✓	×

Authors agree to be accountable for all aspects of the work in ensuring that questions related to the accuracy or integrity of any part of the work are appropriately investigated and resolved.

Ethical Approval:

This Manuscript was approved by the Ethical Review Board of Khyber Medical College, Peshawar. Vide No. 197/DME/KMC. Dated: 11 03 2024