



# ASSOCIATION OF UMBILICAL CORD LENGTH WITH MODE OF DELIVERY

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## ABSTRACT

**OBJECTIVE:** To find out the average length of umbilical cord, variation in umbilical cord length in our antenatal women and to see the association of umbilical cord length with mode of delivery.

**METHODS:** This cross-sectional study was carried out at Lady Reading Hospital, Peshawar Pakistan, from Jan 2018 to Dec 2018. Using non-probability convenience sampling technique, 3300 pregnant women with singleton fetus between 37-42 weeks of gestation were included in the study. Umbilical cord length was measured by standard measuring tape. Umbilical cord length was divided into three groups and its association with mode of delivery was noted in each group.

**RESULTS:** Umbilical cord length in our study varied from 31-100 cm. The mean umbilical cord length was  $56 \pm 9.01$  cm among 3,300 participants. Short umbilical cord length ( $\geq 40$  cm) was found in 62 (1.8%) cases, out of which 36 (58.06%) normal vaginal delivery (NVD) while 21 (33.87%) had Caesarean section (CS). Normal umbilical cord length (41-70 cm) was found in  $n=3,079$  (93%) participants, out of which 2,188 (71.06%) had NVD while CS rate was 17.1% ( $n=526/3079$ ). Long umbilical cord ( $>70$  cm) was found in 159 (4.8%) cases, where 96 (60.4%) had NVD and 31 (19.5%) had CS. Nuchal cords were more common in long umbilical cord group ( $n=136/159$ ; 85.53%) as compared to normal ( $n=371/3079$ ; 12.04%) & short cord length ( $n=3/62$ ; 4.83%).

**CONCLUSION:** Both long and short umbilical cords are associated with higher rate of operative vaginal delivery and caesarean section. Nuchal cords were more in long umbilical cord group.

**KEY WORDS:** Caesarean Section (MeSH); Nuchal Cord (MeSH); Operative vaginal delivery (Non-MeSH); Umbilical cord length (Non-MeSH).

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accidents and mechanical bands around fetal limbs. Cord length may vary according to the length and weight, but had no relationship with the gender of the baby.

Umbilical cord can grow from 40-300 cm long, allowing the baby to have enough cord to move safely without causing damage to the fetus, cord and placenta. At birth the mature cord is about 50-60 cm in length and 12 mm in diameter. A long cord is defined as  $>70$  cm and short cord as  $<40$  cm. Short umbilical cord is uncommon and found in only 6% of pregnancies.<sup>4</sup>

Short umbilical cord may be associated with adverse maternal outcomes such as failure to descend of presenting part, prolonged labour, placental abruption, operative vaginal delivery and cesarean section. Excessively long umbilical cords are associated with cord prolapse, nuchal cords, true knots, entanglement around the fetus and delivery complication due to fetal distress.<sup>5,6</sup>

Antenatal diagnosis of umbilical cord abnormalities is possible by Colour Doppler ultrasound. Three Dimensional Ultrasound is also used to see cord around the neck and cord entanglement. Colour Doppler ultrasound is more sensitive and specific in diagnosing nuchal cords. Extra coiling of cord on Colour Doppler can predict long cord.<sup>7</sup>

There is no local data on cord length in our local population, so we planned this study to find out the average cord length, variation in cord length in our

## INTRODUCTION

The umbilical cord provides main connection between fetus and placenta. It is covered by amnion and contains one large vein and two small arteries, supported in Wharton's jelly. Umbilical cord is the main source of transfer of vital nutrients to the fetus through oxygenated blood via umbilical vein and carries deoxygenated blood back from fetus via umbilical arteries to placenta.<sup>1</sup>

The umbilical cord begins to form around 5 weeks after conception. It becomes progressively longer until 28

weeks of pregnancy, reaching an average length of 50 to 60 cm. As the cord gets longer it coils around itself to become more tortuous.<sup>2</sup>

The umbilical cord length, its position, insertion into placenta and its anomalies are subject to a wide variation and untoward gestational events. The cord insertion and length in the amniotic cavity remain unrecognized till the birth of the baby.<sup>3</sup>

Umbilical cord is found to be a marker of intrauterine complication to the fetus, like increased susceptibility to congenital malformations, cord

**TABLE I: FREQUENCY DISTRIBUTION OF CORD LENGTH AMONG STUDY PARTICIPANTS (N=3,300)**

Cord length ( cm)		Frequency	Percentage
Short cord (n= 62)	31-40	62	1.9
Normal length (n=3079)	41-50	739	22.39
	51-60	1764	53.45
	61-70	576	17.45
	71-80	125	3.78
Long cord (n= 159)	81-90	26	0.78
	91-100	08	0.24

pregnant women and to see the association of cord length with mode of delivery.

## METHODS

This cross-sectional study was carried out in Gynae B unit Lady Reading Hospital, Peshawar Pakistan, from Jan 2018 to Dec 2018, after obtaining ethical approval from Hospital Ethical committee. Using non-probability Convenience sampling, 3300 pregnant women were included in this study. All pregnant women with singleton fetus between 37-42 weeks of gestation who delivered in obstetrics "B" unit of MTI, LRH Peshawar were included in the study. All of them presented in spontaneous labour. Women with fetal demise, anomalous babies, induced labour, previous caesarean section, and having medical disorder like hypertension or diabetes were excluded from this study. Both primigravida and multigravida women were included.

The progress of labour was plotted on Partogram, fetal heart rate monitored by intermittent auscultation and fetal Doppler. Electronic fetal heart rate monitoring by Cardiotocograoh (CTG) was done when required. Fetal blood sampling was not done due to non availability of this facility.

Umbilical cord was examined after delivery whether vaginal or operative for presence of loops around neck, trunk or shoulders. Nuchal cords with number of loops were counted. Knots in the cord (true or false), cord insertion in placenta whether central, eccentric, marginal or velamentous were also noted.

After the delivery of fetus cord was clamped at two places and cut in between. Length was measured from cut end to fetal umbilicus and from other end to insertion into placenta. These two measurements were added to know total length of umbilical cord. Cord length was measured with a flexible tape in centimeters ( cm). Cord length of less than 40 cm was considered short length, 41-70 cm was taken as normal length and more than 70 cm was considered long cord. Maternal outcome was noted in terms of mode of delivery whether it was vaginal, operative vaginal or cesarean section. Statistical analysis was done using SPSS version 22. Chi square test was used to find out p value

## RESULTS

In this study, mean age of 3,300 women was  $29.32 \pm 3.26$  years. Parity ranged between 1-6. Maximum cases seen were n=3,079 ( 93.29%) in the group of cord length between 41-70 cm, while long cord 70-100 cm was found in 159 (4.81%) cases followed by short cord in 62 (1.9%) cases. (Table I) Lower 5th percentile (<40 cm) was considered as short cord and upper 5th percentile (>70 cm) was considered as long cord.

Caesarean section cases were highest in short cord group (n=21/62; 33.87%). Rate of normal vaginal delivery were found highest in patients with normal cord length (n=2188/3,079; 71.06%). No Breech vaginal delivery was seen in short cord and length above 80 cm (Table II).

Nuchal cords were more common in long umbilical cord group (n=136/159; 85.53%) as compared to normal

(n=371/3079; 12.04%) & short cord length (n=3/62; 4.83%) [Table III]. Placental insertion of cord was central in 2,108 (63.87%), marginal in 960 (29.09), eccentric in 228 (6.09%) while velamentous in only 4 (0.12%) patients.

## DISCUSSION

Our study included 3300 women who came in spontaneous labour and had delivery in our labour suit. Mean age of our women was  $29.32 \pm 3.26$  years and parity ranged between 1-6. We included 3300 women (consecutive convenient sampling) in our study as we had no data available in Pakistan regarding measurement of average cord length in our pregnant women. Two studies from India included one thousand and 500 women to see the association of umbilical cord length with perinatal outcome and mode of delivery.<sup>14,16</sup>

Mean umbilical cord length in the present study was  $56 \pm 9.01$  cm. Maximum numbers of cases were found in range of 41-70 cm (93.29%) and this was labeled as normal cord length group. Same observations were found in study by Olaya.<sup>8</sup> Short umbilical cord was seen in 62 (1.9%) and long cord in 159 (4.81%) cases in our study. Nuchal cord was found in 108 (67.92), 5 cases with single loop, and total number of 136 (85.53%) cases. Three loops of cord were present in 8 (12.57%) cases in long cord group. Higher percentage of nuchal cord was seen in long cord group. These results are comparable to a study by Sanad ZF et al.<sup>9</sup>

The incidence of operative intervention increases at extremes of length i.e. both short and long cord. In short cord risk of fetal distress and labour abnormalities in terms of failure to descend of presenting part increases which leads to increased incidence of instrumental deliveries and caesarean section.<sup>10,11</sup> In our study instrumental deliveries were 8.6% and caesarean sections were 33.87% in short cord compared to normal length which was 8.3% and 17.00 %. These results are comparable to study by Dolgun ZN, et al. and Krakowik P, et al.<sup>12,13</sup>

Long cord group had more than 70% cesarean section due to fetal distress

**TABLE II: ASSOCIATION OF UMBILICAL CORD LENGTH WITH MODE OF DELIVERY**

Cord length (n= 3,300)		Mode of delivery					P. Value
Type of Umbilical cord	Length of cord	NVD n (%)	VBAC n (%)	Breech n (%)	Instrumental delivery n (%)	Cesarean section n (%)	
Short cord (n=62)	31-40 cm	36 (58.06%)	0	0	05 (8.06%)	21 (33.87%)	P < 0.002
Normal cord (n=3,079)	41-50 cm n=739	608 (82.27%)	19 (2.57%)	11 (1.48%)	57 (7.71%)	127 (17.18%)	P<0.025
	51-60 cm n=1764	1151 (65.24%)	19 (1.07%)	21 (1.19%)	118 (6.68%)	306 (17.34%)	
	61-70 cm n=576	429 (74.47%)	17 (2.95%)	20 (3.47%)	83 (14.40%)	93 (16.14%)	
Long cord (n= 159)	71-80 cm n=125	90 (56.6%)	06 (3.77%)	06 (3.77%)	15 (9.4%)	17 (10.60%)	P<0.002
	81-90 cm n=26	06 (3.77%)	0	0	02 (1.25%)	9 (5.66%)	
	91-100 cm n=08	0	02 (1.25%)	0	01 (0.62%)	05 (3.14%)	

NVD: Normal vaginal delivery; VBAC: Vaginal birth after cesarean section

**TABLE III: FREQUENCY DISTRIBUTION OF NUCHAL CORDS AMONG VARIOUS UMBILICAL CORD GROUPS**

NO OF LOOPS	CORD LENGTH					
	Short <40 cm (n=62)		Normal 41-70 cm (n=3079)		Long Cord >70 cm (n=159)	
	n	%age	n	%age	n	%age
One	3	4.83	270	8.76	108	67.92
Two	0	0.0	76	2.46	20	12.57
Three	0	0.0	25	0.81	08	5.03
TOTAL	3	4.83	371	12.04	136	85.53

which was secondary to nuchal cords, cord prolapse, and fetal heart rate abnormalities. Fetal distress was diagnosed on the basis of pathological CTG findings. This should be confirmed by fetal blood sampling but we don't have this facility in our Hospital. Instrumental deliveries were 11.3% and caesarean sections were 19.49% in this group. These results are comparable to study by Nandini B, et al.<sup>14</sup>

Our result show higher rates of caesarean delivery in both long and short cord lengths compared to study by La Monica GE, et al.<sup>15</sup> Same risks of operative interference are given for both long and short cord in a study by Shiva Kumar HC, et al. as observed in our study.<sup>16</sup> In a study by Yadav BB, et al. caesarean section rate was significantly high in long cord with two loops of

nuchal cord ( $p < 0.001$ ).<sup>17</sup> Short cords were associated with failed progress of labour and increased operative delivery.<sup>18</sup> Poor perinatal outcome was seen in cases of short and excessively long cords.<sup>19,20</sup>

## CONCLUSION

Umbilical cord length is associated with mode of delivery. Short and long umbilical cords are associated with increased incidence of operative vaginal delivery and caesarean section. Nuchal cords were more common in long umbilical cord group. Unfortunately we don't have any studies or data related to length of umbilical cord in our pregnant women. We need to perform other studies in which Colour Doppler ultrasound findings (in Antenatal women) of nuchal cord and excessive coiling of umbilical cord is confirmed at

the time of delivery.

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### AUTHORS' CONTRIBUTIONS

Following authors have made substantial contributions to the manuscript as under

**TS:** Acquisition of data, data analysis, drafting the manuscript, approval of final version to be published

**SB:** Acquisition of data, drafting the manuscript, approval of final version to be published

**RR:** Conception and study design, Analysis and interpretation of data, drafting the manuscript, approval of the final version to be published

*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.*

#### CONFLICT OF INTEREST

Authors declared no conflict of interest

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NIL

#### DATA SHARING STATEMENT

The data that support the findings of this study are available from the corresponding author upon reasonable request.



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