The Egyptian Journal of Hospital Medicine (January 2023) Vol. 90, Page 1776-1780

Perinatal outcome in Umbilical Cord Entanglement

Alaa El din Mahmoud Ismail, Ahmed Mohamed Alaa El din Mahmoud Youssef, Ghada Gamal Ali*, Ahmed M. A. Sobh

Department of Obstetrics and Gynecology, Assiut University, Faculty of Medicine, Assiut University, Assiut, Egypt

***Corresponding author:** Ghada Gamal Ali, **Mobile:** (+20) 01287963447, **Email:** ataxia87@yahoo.com

ABSTRACT

Background: Prematurity and congenital abnormalities happened as a result of umbilical cord entanglement. It is possible to link cord-related problems, in which the foetal circulation is hampered by obstruction of the umbilical veins, to a major fraction of instances of intrauterine foetal death.

Objectives: To evaluate how the results of the delivery are affected by nuchal umbilical cord (UC) loops during labour.

Patients and Methods: A cross-sectional study included 470 women with singleton deliveries between 37-41 weeks of gestation from May 2019 till November 2020. Nuchal cord presence was categorized as either present or missing. The quantity of loops and the delivery results were noted, if applicable. After birth, the length of the umbilical cord was measured to see if nuchal cord loops were present.

Results: The participants were classified into cases group (those with nuchal cord, n-220) and control group (without nuchal cord, n=250). The length of UC was significantly higher in the cases group (89.30 ± 14.44 vs. 73.57 ± 18.66 cm, P<0.0001) No significant differences between both groups regarding the rate of Apgar scores 7 (P-0.21), neonatal care unit admission (P-0.96) and perinatal mortality (P-0.26). Meanwhile, the length of UC was significantly higher in those with multiple nuchal loops (n=36) than single nuchal loop (n=184) (100.35 ± 1042 vs. 86,84 ± 14.07 cm. P<0.0001). The rate of Apgar scores 7, neonatal care unit admission and perinatal mortality was significantly higher in women with multiple nuchal loops than with single nuchal loop (P-0.007, 0.011, 0.043, respectively).

Conclusions: Multiple nuchal cord loops increase the risk of prenatal morbidity and death in newborns. Nuchal cord loops are more frequent when the UC is long.

Keywords: Umbilical cord, Perinatal mortality, Nuchal cord loops, Entanglement.

INTRODUCTION

The placenta and foetus are fundamentally connected via the umbilical cord (UC), which supports life. It includes a consistent bond between the mother and foetus and permits foetal mobility, which is essential for foetal maturation in general and neuromotor development in particular. The UC's design gives it a special blend of mechanical toughness and flexibility. However, a number of umbilical cord issues that might be hazardous to the foetus can be identified by the qualities of the chord [1, 2].

The cord may become tangled around it or in another area of the foetus. This incident happens in 16 to 30 percent of births [3]. An umbilical chord that completely encircles the foetal neck is known as a nuchal cord [4].

Foetal movement that is facilitated by an excess of amniotic fluid next to the umbilical cord results in cord entanglement [5].

The clinical significance of the nuchal cord and the quantity of loops are still up for debate. It is still unclear how to handle the detected nuchal cord during pregnancy and how many loops should be placed around the neck [2].

Cord anomalies are linked to a number of issues, including foetal hypoxia during birth, growth retardation, respiratory issues, and labour difficulties. Because of their impact on umbilical blood flow, nuchal cords are one of the factors that put a foetus at danger of dying [6].

Multiple loops on the nuchal cord have been associated with a higher risk of foetal morbidity and death [2]. The aim of the study was to evaluate how the results of the delivery are affected by nuchal umbilical cord (UC) loops during labour.

PATIENTS AND METHODS

A cross-sectional study included 470 women with singleton deliveries between 37-41 weeks of gestation from May 2019 till November 2020. Nuchal cord presence was categorized as either present or missing. The quantity of loops and the delivery results were noted, if applicable. After birth, the length of the umbilical cord (UC) was measured to see if nuchal cord loops were present.

The study group included both primigravida and multigravida and excluded multiple pregnancies and any previous uterine surgeries. Details of delivery of baby including mode of delivery, Apgar score, neonatal intensive care unit (NICU) admission were evaluated.

After the baby was delivered, the umbilical cord's length was measured. It was clamped twice and then cut in the middle.

Flexible tape was used to measure the length in centimetres and add it from the cut end to the foetal umbilicus and placental connection umbilical cord. Umbilical chord measures were divided into short, normal, and long cords depending on whether they were less than 39 cm, between 39 cm to 95 cm, or greater than 95 cm [7].

Received: 09/09/2022
Accepted: 12/11/2022

Ethical approval:

The study was authorised by Assiut University's Ethical Institutional Review Board. All study participants provided written informed permission after being informed of our research's goals. The Declaration of Helsinki for human beings, which is the international medical association's code of ethics, was followed during the conduct of this study.

Statistical analysis

In order to conduct the statistical analysis, statistical package for social science (SPSS) version 17.0 for Windows was used. The study's sample size was determined as 220, with a power of 90% and a dropout rate of 20%. Categorical data were examined using the Chi-square test or Fisher exact test, while continuous data were analysed using the t-test. If P value 0.05, it was significant.

RESULTS

A total of 470 cases were evaluated in the study, the study group was 220 cases with cord entanglement and the control group was 250 without cord entanglement.

The 220 cases with cord entanglement were analyzed and 180 cases (81.8%) with single loop, 29 cases (13.2%) with two loops and 11 cases (5%) with more than two loops. Among the single loop cases, 36 cases (20%) of them undergo cesarean section (C.S) and 144 cases (80%) have delivered by normal vaginal delivery (NVD), while in the two loops cases, 13 (44.8%) with C.S and 16 (55.2%) delivered normally and with more than two loops 2 cases (18.2%) with C.S and 9 (81.2%) delivered normally as shown in table (1).

Table (1): Number of loops and mode of delivery in the study group:

Number of loops	No. (220)	Delivery by CS	Delivery by NVD
Single loop	180 (81.8%)	36 (20 %)	144 (80%)
Two loops	29 (13.2%)	13 (44.8%)	16 (55.2%)
More than two	11(5.0%)	2 (18.2%)	9 (81.8%)

CS: cesarean section; NVD: normal vaginal delivery

The length of the cord was measured in the study group (cases with cord entanglement) and the results were in short cord 2 (33.3%) cases delivered vaginally and 4 (66.7%) cases delivered by CS while in in normal length of the cord were 137 (79.2%) cases delivered vaginally and 36 (20.8%) cases delivered by CS but in in long cord were 30 (73.2%) cases delivered vaginally and 11 (26.8%) cases delivered by CS.

There was clinically significance in the study group between the mode of delivery and length of the cord with the p value was 0.027 as shown in table (2).

Table (2): Relation in the study group between length of the cord mode of delivery:

Mode of delivery	Length of the cord						P-value
	Short		Normal		Long		
	No.	%	No.	%	No.	%	
NVD	2	33.3%	137	79.2%	30	73.2%	0.027*
CS	4	66.7%	36	(20.8%)	11	26.8%	

CS: cesarean section; NVD: normal vaginal delivery

We take 250 cases as a control group without cord entanglement and 61 (24.4%) cases of them undergo C.S and 189 (75.6%) delivered normally. The length of the cord was measured and the results in short cord group were 10 (55.6%) cases delivered vaginally and 8 (44.4%) cases delivered by CS while in the group with normal length of the cord 169 (77.2%) cases delivered vaginally and 50 (22.8%) cases delivered by CS but in in long cord group 10 (76.9%) cases delivered vaginally and 3 (23.1%) cases delivered by CS. There was no significant difference in the study group between the mode of delivery and length of the cord and the p value was 0.121 as shown in table (3).

There was no significant difference between the mode of delivery in the study and the control groups and the p value was 0.77.

Table (3): Relation in the control group between length of the cord and mode of delivery:

Mode of delivery	Length of the cord						P-value
	Short		Normal		Long		
	No.	%	No.	%	No.	%	
NVD	10	55.6 %	169	77.2 %	10	76.9 %	0.121
CS	8	44.4 %	50	22.8 %	3	23.1 %	

CS: cesarean section; NVD: normal vaginal delivery

In the study group we found 36 (16.4%) cases out of 220 had poor fetal outcomes. We observed low Apgar score in 13 (7.2%) in single loop, 6 (20.7%) in two loops and 3 (27.3%) in more than two loops. Also, NICU admission in 4 (2.2%) in single loop, 2 (6.9%) in two loops and 3 (27.3%) in more than two loops. Finally, 5 cases perinatal fetal death two of them stillbirths with single tight nuchal cord and three cases early neonatal deaths with more than two loops of the cord around the neck as shown in table (4).

Table (4): Relation between number of loops of the cord and fetal complications in the study group:

Fetal complications	Number of loops					
	single (n= 180)		Two (n= 29)		More than two (n= 11)	
	No.	%	No.	%	No.	%
Total complications (36)	19	10.5 %	8	27.6 %	9	81.9 %
Low Apgar score (22)	13	7.2 %	6	20.7 %	3	27.3 %
NICU admission (9)	4	2.2 %	2	6.9%	3	27.3 %
Perinatal fetal death (5)	2	1.1 %	0	0.0%	3	27.3 %

NICU: neonatal intensive care unit

In the study group, we found 36 (16.4%) cases out of 220 had poor fetal outcomes. We observed low Apgar score in 1 (16.7%) in short cord, 16 (9.2%) in normal length of the cord and 5 (12.2%) in long cord. Also, NICU admission in 6 (3.5%) in normal length of the cord, 3 (7.3%) in long cord and finally perinatal fetal death observed in 2 (33.3%) in short cord, 2 (1.2%) in normal length of the cord and 1 (2.4%) in long cord as shown in table (5).

Table (5): Relation between length of the cord and fetal complication in study group

Fetal complication	Length of the cord n=220					
	Short cord (n= 6) 2.7%		Normal cord (n= 173) 78.6%		Long cord (n= 41) 18.6%	
	No.	%	No.	%	No.	%
Total complications	3	50%	24	13.9%	9	21.9%
Low Apgar score	1	16.7%	16	9.2%	5	12.2%
NICU admission	0	0.0%	6	3.5%	3	7.3%
Perinatal fetal death	2	33.3%	2	1.2%	1	2.4%

NICU: neonatal intensive care unit

In the study group**,** there was significant increase in the total foetal complications in cases with multiple number of loops compared to those with single loop with p value 0.000. Low Apgar score, NICU admission and Perinatal fetal death were clinically significant between single and multiple loops, and the p value were 0.007, 0.011, 0.043 respectively as shown in table (6).

Table (6): Relation in the study group between number of loops and fetal complications:

Fetal complication	Number of loops		P-value
	Single (n=180) No. (%)	Multiple (n=40) No. (%)	
Total complications	19 (10.6%)	17 (42.5%)	0.000*
Low Apgar score	13 (7.2%)	9 (22.5%)	0.007*
NICU admission	4 (2.2%)	5 (12.5%)	0.011*
Perinatal fetal death	2 (1.1%)	3 (7.5%)	0.043*

NICU: neonatal intensive care unit

In the control group, there was clinically significant difference as regard total fetal complications between short cord group 6 (33.3%) cases, group with normal length of the cord 20 (9.1%) and long cord group 3 (23.1%) with p value 0.004. low Apgar score was 3 (16.7%) cases in short cord group, 12 (5.5 %) in group with normal length of the cord and 2 (15.4%) in long cord group with p vale 0.087. Also, NICU in 2 (11.1%) in short cord group, 7 (3.2 %) in group with normal length of the cord and 1 (7.7%) in long cord group with p vale 0.202.

Finally, two cases perinatal fetal death one of them early neonatal fetal death with short cord group and one case still birth with group with normal length of the cord as shown with p vale 0.062 in table (7).

Table (7): Relation between length of the cord and fetal complication in control group

Fetal complication	Length of the cord						P-value
	Short cord (n= 18)		Normal cord (n= 219)		Long cord (n= 13)		
	No.	%	No.	%	No.	%	
Total complications	6	33.3 %	20	9.1 %	3	23.1 %	0.004 *
Low Apgar score	3	16.7 %	12	5.5 %	2	15.4 %	0.087
NICU admission	2	11.1 %	7	3.2 %	1	7.7%	0.202
Perinatal fetal death	1	5.6%	1	0.5 %	0	0.0%	0.062

NICU: neonatal intensive care unit

There was no significant difference between study and control group as regard total fetal complication, Low Apgar score, NICU admission and Perinatal fetal death with p value 0.136, 0.210, 0.960 and 0.260 respectively as shown in table (8).

Table (8): Fetal complication between study and control groups:

Fetal complication	Study (n= 220)		Control (n= 250)		P-value
	No.	%	No.	%	
Fetal complication	36	16.4%	29	11.6%	0.136
Low Apgar score	22	10.0%	17	6.8%	0.210
NICU admission	9	4.1%	10	4.0%	0.960
Perinatal fetal death	5	2.3%	2	0.8%	0.260

There was significant increase in the length of the cord in the study group compared to control group with p value 0.000 as shown in table (9).

Table (9): Length of the cord between study and control groups:

Length of the cord	Study (n= 220)	Control (n= 250)	P-value
Mean ± SD	89.30 ± 14.44	73.57 ± 18.66	0.000*
Range	37.0-130.0	35.0-137.0	

There was weak positive correlation in the study group between number of loops and total fetal complications, but no correlation and clinically significant Low Apgar score, NICU admission and Perinatal fetal death with r value 0.350, 0.196, 0.213, 0.192 respectively and p value 0.000, 0.003, 0.001, 0.004 respectively.

There was no correlation with no significant difference in the control group between length of the cord and total fetal complications.

DISCUSSION

The goal of the current study was to determine how nuchal umbilical cord (UC) loops during labour affected the results of deliveries.

In the study group with those with nuchal cord, found that 36 (16.4%) cases out of 220 had poor fetal outcomes. We observed low Apgar score in 13 (7.2%) in single loop, 6 cases (20.7%) in two loops and 3 cases (27.3%) in more than two loops. Also, NICU admission observed among 4 cases (2.2%) in single loop, 2 (6.9%) in two loops and 3 (27.3%) in more than two loops.

Finally, 5 cases perinatal fetal death, two of them stillbirths with single tight nuchal cord and three cases early neonatal deaths with more than two loops of the cord around the neck.

These findings corroborated those of **Schreiber *et al.* [(2)],** who discovered that the presence of a nuchal cord with three loops was linked to an increased risk of intrauterine foetal death, an increase in the prevalence of Apgar scores below seven at one and five minutes, and an increased incidence of intrauterine growth restriction. However, their findings don't match those of the current study because they discovered that a nuchal cord with a single loop is not linked to a poor perinatal

The findings of the current study corroborate those of **Soliriya *et al.* [(6)]**, who discovered that 11 (9.24%) out of 119 cases with nuchal cord showed changes in the foetal heart rate. 19 (15.96%) patients were brought to the NICU, of which 17 (14.28%) had low Apgar scores, one infant was macrosomic, and the other had a congenital defect.

According to **Shereen *et al.* [(8)] study**, additional factors besides the nuchal cord contributed to unfavorable perinatal outcomes and NICU admissions, such as low birth weight, respiratory distress, and IUGR.

Our study's findings disagree with those of **Begum *et al.* [(9)], Larson *et al.* [(10)] and Sill [(11)]**, who found no evidence of foetal death linked to the nuchal cord.

According to the study, instances with nuchal cords have considerably longer mean chord lengths than cases without nuchal cords, which is consistent with **Soliriya *et al.* [(6)]**.

In the study group, we found 36 (16.4%) cases out of 220 had poor fetal outcomes. We observed low Apgar score in 1 (16.7%) in short cord, 16 (9.2%) in normal length of the cord and 5 (12.2%) in long cord. Also, NICU admission in 6 (3.5%) in normal length of the cord, 3 (7.3%) in long cord and finally perinatal fetal death observed in 2 (33.3%) in short cord, 2 (1.2%) in normal length of the cord and 1 (2.4%) in long cord.

These findings corroborated those of **Yadav *et al.* [(12)]**, who discovered a significant rate of perinatal death (0.6%) in lengthy cords. The findings of **Schaffer *et al.* [(13)]** that nuchal cords seldom cause embryonic mortality, however, were not in agreement.

According to our findings, the rate of caesarean sections was greater in cases with nuchal cords with two or more loops than in cases of a single loop, which is in line with **Soliriya *et al.* [(6)]**.

The effectiveness of the nuchal cord on perinatal outcomes has to be confirmed in more research with a bigger sample size.

CONCLUSION

The conclusions of our study were that the neonates with multiple nuchal cord loops at increased risk of perinatal morbidity and mortality.

Supporting and sponsoring financially: Nil.
Competing interests: Nil.

REFERENCES

1. **Bosselmann S, Mielke G (2015):** Sonographic assessment of the umbilical cord. Geburtshilfe und Frauenheilkunde, 75(8): 808-18.

2. **Schreiber H, Daikan Y, Arbib N *et al.* (2018):** Adverse pregnancy outcomes and multiple nuchal cord loops. Arch Gynecol Obstet., 300(2):279-283.
3. **Rogers M, Ip Y, Qin Y *et al.* (2003):** Relationship between umbilical cord morphology and nuchal cord entanglement. Acta Obstet Gynecol Scand., 82:32-37.
4. **Peregrine E, O'brien P, Jauniaux E (2005):** Ultrasound detection of nuchal cord prior to labor induction and the risk of Cesarean section. Ultrasound in Obstetrics & Gynecology, 25(2):160-4.
5. **Martínez-Aspas A, Raga F, Machado L *et al.* (2012):** Umbilical Cord Entanglement: Diagnostic and Clinical Repercussions. Donald School Journal of Ultrasound in Obstetrics and Gynecology, 6(3):225-232.
6. **Soliriya V, Goyal M, Kachhawaha C *et al.* (2017):** Perinatal Mortality and Umbilical Cord Parameters: Is there Any Association? Journal of Pregnancy and Child Health, 4(04):10-3.
7. **Abaidoo C, Boateng K, Warren M (2008):** Morphological Variations of the "Baby\'s Supply Line". Journal of Science and Technology, 28(2):1-9.
8. **Shereen K, Patel K, Swami M (2015):** Nuchal cord and perinatal outcome. Kathmandu University Medical Journal, 7(1):15-7.
9. **Begum A, Sultana H, Hasan R *et al.* (2011):** A clinical study of fetal outcome in cases of nuchal cord. Journal of Armed Forces Medical College, Bangladesh, 7(1): 25–27.
10. **Larson J, Rayburn W, Harlan V (1997):** Nuchal cord entanglements and gestational age. Am J Perinatol, 14(09):555-7.
11. **Sill F (1992):** Outcome of infants born with nuchal cords. J Fam Pract., 34:441-5.
12. **Yadav B, Kurdukar D, Darade R *et al.* (2013):** Correlation of umbilical cord length with foetal and maternal outcome. Journal of Evolution of Medical and Dental Sciences, 2:412-7.
13. **Schäffer L, Burkhardt T, Zimmermann R *et al.* (2005):** Nuchal cords in term and postterm deliveries—do we need to know? Obstet Gynecol., 106(1):23-8.