Effect of Nuchal Cord on Mode of Delivery and Perinatal Outcome

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ABSTRACT:

BACKGROUND:

Nuchal cord is blamed for problems that are encountered during delivery and for increased risk of adverse perinatal outcome such as fetal heart decelerations and perinatal mortality.

Study design

A case-control, prospective study.

OBJECTIVE:

To compare mode of delivery, duration of labour, and fetal outcome in pregnants with and without nuchal cord.

MATERIALS AND METHODS:

One hundred and fifty full term pregnant women were enrolled in this study, half of them were with nuchal cord (diagnosed by ultrasound and confirmed during labour) served as study group, and the remaining were without nuchal cord and served as control.

Fetomaternal outcome including mode of delivery, duration of labour, presence of intrapartum fetal heart rate irregularities, presence of meconium, fetal weight, Apgar score at 1 and 5 minutes, and neonatal care unit admission were compared in the two groups and the data were arranged on questionnaire forms and subjected to analysis.

RESULTS:

Pregnancy with Nuchal cord has 2.6 folds increase in caesarean section rate than controls (21.3%) vs. (9.3%), mainly because increased fetal heart rate irregularities (3.2 folds), and prolonged second stage of labour.

Meconium staining of liquor was more frequently seen among nuchal cord group than controls. Fetal outcome was found to be associated with higher incidence of low birth weight, low Apgar score at 1 and 5 minutes and more neonatal care unit admission in pregnants with nuchal cord.

CONCLUSION:

Nuchal cord is associated with adverse perinatal outcome including low apgar scores, fetal distress and increased cesarean section rate.

KEY WORDS: nuchal cord, perinatal outcome.

INTRODUCTION:

Cord around fetal neck is seen in 25% of deliveries, it can be seen during pregnancy or occurs during labour because of fetal movement can spin the cord around their neck. It is more common with increasing gestation, it is rare before 20 weeks probably due to short cord compared to fetal body [1,2]. Nuchal cord may be single, double or triple and more in male fetuses perhaps due to having longer cords [3, 4].

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Nuchal cords can be classified by the Giacomello classification system in two types [5]:

A _a nuchal loop 360 degrees around the neck of the fetus where the placental end crosses over the umbilical end, entangling the neck in an unlocked pattern that can undo itself.

B _a nuchal loop 360 degrees around the fetal neck where the placental end crosses under the umbilical end, and this entangling the neck in a locked pattern that cannot undo itself. This pattern can form a true knot when it passes down over the fetal body.

Ultrasound diagnosis of a nuchal cord was first described in 1982 by Jouppila and Kirkinen, and since then ultrasound diagnosis has aided in obstetric management [6]. Colour Doppler has increased the accuracy of prenatal diagnosis, and various studies have mentioned that its sensitivity varying from 60%- 95% [7].

PATIENTS AND METHODS:

This is a prospective, case-control study, conducted at Al-Elwiya Maternity Teaching hospital in Baghdad during the period from 1st May 2014 to end of July 2015. The participant were selected while attending the labour ward for delivery.

Study population:

A total of 150 term pregnant women were enrolled in this study consisted of:

Study group:

Consisted of 75 term pregnant women with cord around fetal neck diagnosed by ultrasound and confirmed at labour, excluding false positive ultrasound finding of nuchal cord not confirmed at labour (8 pregnant women)

Control group: Included 75 term pregnant women without cord around fetal neck.

Inclusion criteria

A living singleton pregnancies of completed 37-40 weeks gestation with cephalic presentation. No fetal or umbilical cord anomaly and no maternal medical problems.

Exclusion-criteria:

Presence of growth restriction, previous cesarean section, placenta previa, and any factors which can independently cause adverse perinatal and neonatal outcome and can act as confounding factors are excluded from the study (like smoking or drugs).

Data collection and tools of study:

Data of the study participants were collected through a full history taking (medical, obstetrical and gynecological) and clinical and ultrasonographic findings by using a pre-constructed data collection sheet (questionnaire).

Laboratory and ultrasonographic investigations:

The participants were investigated for routine laboratory tests including complete blood count, urine analysis and blood sugar.

Doppler Ultrasound was performed to the participants to assess fetal and umbilical cord condition. Presence of nuchal cord and number of loops were reported and further confirmed at time of labour. Images taken in transverse and sagittal planes to find out umbilical cord around fetal neck. A nuchal cord was diagnosed when the cord seen lying around at least 3 of the 4 sides of neck.

Both studied groups were compared regarding their maternal age, parity, gestational age, ultrasound during pregnancy, mode of delivery, duration of expulsion in case of vaginal delivery and cesarean section rate.

Further confirmation of the umbilical cord condition was done during delivery including , type of nuchal cord (tight or loose), number of loops were recorded.

Loose nuchal cord was considered when it is easily uncoiled before delivery of the fetal trunk. While when clamping and cutting the cord was necessary before uncoiling, the cord was considered to be tight.

Labour monitoring: The participants were monitored closely during labour by partogram and cardiotocography. Fetal distress was regarded when fetal bradycardia, variable deceleration or late deceleration was found. Prolonged labour was recognized when there is no progressive cervical dilatation and or descend of presenting part in spite of efficient uterine contraction. The fetal outcome was assessed by pediatrician regarding the Apgar score, birth weight, and need for NICU admission.

Ethical issues:

1. The study approved by the scientific council of the Obstetrics and Gynecology of the Arab Board of Health Specialization.
2. Official agreement of the Al-Elwiya Maternity Teaching hospital Administration Office was obtained.
3. Verbal consents were obtained from the participants.

Statistical analysis:

Descriptive statistics were presented as mean, standard deviation (SD) for continuous variables (maternal age and gestational age), and for other, categorical, variables presented as frequencies (No.) and proportions (%). Chi square test was used to compare frequencies and estimate the significance of the relationship between categorical variables between the studied groups. Independent Student's t test was used to compare both studied groups regarding the maternal and gestational age mean. P. value of ≤ 0.05 considered to be significant.

RESULTS:

The baseline characteristics of women in both studied group are shown in table 1. No significant differences was found between both groups regarding maternal age, gestational age, gravidity and parity.

Table 1:Demographic and Obstetrical characteristics of studied groups.

Variable		Cases (n = 75)		Controls (n = 75)		P
		N	%	N	%	
Mean maternal age (year)		23.9 ± 3.5	-	23.8 ± 3.3	-	0.87*
Mean gestational age (week)		38.27 ± 1.03	-	38.31 ± 1.01	-	0.81*
Gravidity	1 – 2	35	46.7	36	48.0	0.74
	3 – 4	32	42.7	34	45.3	
	5 – 6	8	10.6	5	6.7	
Parity	Nulliparous	15	20.0	13	17.3	0.48
	1 – 2	43	57.3	50	66.7	
	3 – 4	17	22.7	12	16.0	
Abortion		11	14.7	7	9.33	0.45

* not significant

Type and number of loops of nuchal cord of cases group:

Loose nuchal cord was seen in majority of cases, 68 (90.7%), while it was tight in only 7 cases. On the other hand, one loop around fetal neck seen in 64 pregnants (85.4%) and 2 loops seen in 7 pregnants (9.3%) and 3 or 4 loops was found in 5.3% of the participants(Fig1 and 2).

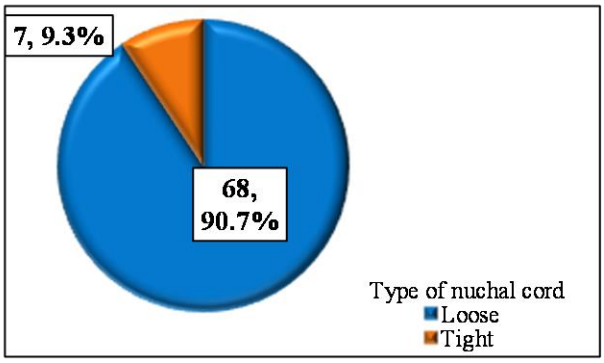

Figure 1: Distribution of types of nuchal cord of cases group.

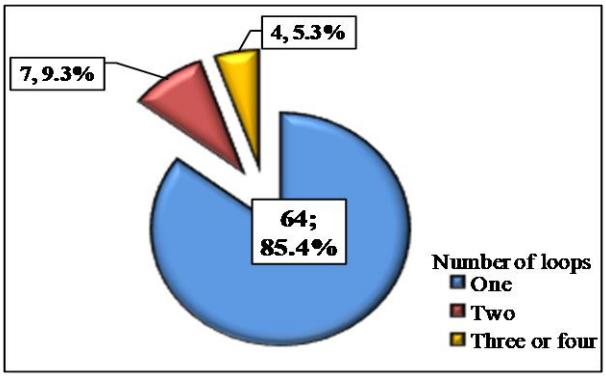

Figure 2: Distribution of number of loops of nuchal cord of study group.

Comparison of mode and duration of delivery: There is a statistically significant association between the presence of nuchal cord and caesarean section rate. Pregnants with nuchal cord were about 2.6 folds more likely to delivered by cesarean section than controls. Prolonged 1st and 2nd stage of labour was more frequently encountered with nuchal cord (Table 2).

Table 2: Mode and duration of delivery of both studied groups.

Variable		Study (n = 75)		Control (n = 75)		OR (95% CI)	P
		N	%	N	%		
Mode of delivery	Cesarean section	16	21.3	7	9.3	2.63 (1.01 – 6.84)	0.034 *Sig*
	NVD	59	78.7	68	90.7		
Duration of labour	Prolonged 1st stage	5	6.7	3	4.0	2.1 (0.47 – 9.2)	0.47*
	Prolonged 2nd stage	17	22.7	8	10.7	2.57 (1.1 – 6.4)	0.039 *sig*
	Normal #	53	68.0	64	85.3	-	

OR: odds ratio, 95% CI: 95% confidence interval sig: significant P<0.05. * not significant P>0.05, # normal used as a reference category for OR calculation of each stage of labour.

Intrapartum events in relation to nuchal cord: Pregnancy in nuchal cord group were about 3.2 folds more likely to have fetal heart irregularities than controls (odds ratio=3.21, p value=0.027). Variable deceleration is the most common and reported only in 8 pregnants with nuchal cord (10.7%) and not found in control group. Late deceleration and brdycardia less commonly found.

The meconium staining of liquor was more frequent among nuchal cord group than controls however, the difference and odds ratio didn't reach the statistical significance, (odds ratio = 1.65, P=0.32), (Table 3).

Table 3 : Comparison of Intrapartum events in relation to nuchal cord in both groups.

		Study (n=75)		Control (n=75)		OR (95% CI)	P
		n	%	n	%		
Fetal heart irregularities							
	Present						
	Variable deceleration	8	10.7	0	0.0	-	-
	Late deceleration	5	6.7	4	5.3	-	-
	Bradycardia	1	1.3	1	1.3	-	-
	Total	14	18.7	5	6.6	3.21 (1.09 - 9.44) $	0.027*
	Absent	61	81.3	70	93.4		
Meconium staining of liquor							
	Present	11	14.7	7	9.3	1.65 (0.60 – 4.51)	0.32
	Absent	64	85.3	68	90.7		

* significant at P<0.05, $: OR calculated for total Fetal heart irregularities vs. absent

Apgar score and admission to NICU in relation to nuchal cord: Nuchal cord group women were about 2.5 folds more likely to have neonates with lower Apgar score at 1 minute than controls, 17 (22.7%) of cases and 8 (10.7%) of controls (odds ratio = 2.45, P=0.042). From other point of view, no statistically significant difference was found

between both groups regarding Apgar score at 5 min (OR = 1.52, P= 1.0).
Moreover,14 neonates (18.7%) of the nuchal cord group needed admission to the NICU compared to 8 (10.7%) of controls, however the difference was statistically insignificant, (OR = 1.90, P= 0.17)(Table 4).

Table 4: Apgar Score and NICU Admissions in relation to Nuchal Cord.

Variable		Study (n = 75)		Control (n = 75)		OR (95% CI)	P
		n	%	n	%		
Apgar score							
At 1 min	< 7	17	22.7	8	10.7	2.45 (1.06 – 6.10)	0.042 *sig*
	≥ 7	58	77.3	67	89.3		
At 5 min	< 7	3	4.0	2	2.7	1.52 (0.25– 9.4)	1.0*
	≥ 7	72	96.0	73	97.3		
Admission NICU							
	Yes	14	18.7	8	10.7	1.90 (0.85- 4.23)	0.17*
	No	61	81.3	67	89.3		
sig: significant at P<0.05, * insignificant P>0.05.							

Weight of babies:
Mean birth weight of babies in nuchal cord group was significantly lower than that of controls; 3.1± 0.3 vs. 3.3 ± 0.4 kg, respectively, (P= 0.004) (Table 5).

Table 5: Comparison of birth weight of babies in both studied group.

Birth weight (kg)	Study (n = 75)	Control (n = 75)	t test	P
Mean ± SD	3.1± 0.3	3.3 ± 0.4	2.9	0.004
Range	2.5 - 4.0	2.9 - 4	-	-

Relation among nuchal cord, mode of delivery and perinatal outcome:
Presence of tight nuchal cord was significantly associated with higher incidence of cesarean section; 6/7 women (85.7%), compared to only 10/68 (14.7%) of those with loose type, (P<0.001). Moreover, tight nuchal cord was significantly associated with prolonged second stage of labour (P=0.011), higher frequency of fetal heart irregularities (P=0.001), high frequent lower Apgar score (<7) at 1 min (P= 0.001), and at 5 min (P= 0.013), and more frequent admission to NICU (P=0.006)(Table 6).

Table 6: Relationship of nuchal cord type with mode of delivery and perinatal outcome in the study group.

Variable		Type of nuchal cord				Total	P
		Tight (N=7)		Loose (N=68)			
		N	%	N	%		
Mode of delivery	Cesarean section	6	85.7%	10	14.7%	16	< 0.001
	NVD	1	14.3%	58	85.3%	59	
Duration of labour	Prolonged 1st stage	1	14.3%	4	5.9%	5	0.12
	Prolonged 2nd stage	4	57.1%	13	19.1%	17	0.011
	Normal #	2	28.6%	51	75.0%	53	-
FHR irregularities	Present	5	71.4%	9	13.2	14	0.001
	Absent	2	28.6%	59	86.8	61	
Apgar score at 1 min.	< 7	5	71.4%	12	17.6%	17	0.001
	> 7	2	28.6%	56	82.4%	58	
Apgar score at 5 min.	< 7	2	28.6%	1	1.5%	3	0.013
	> 7	5	71.4%	67	98.5%	72	
NICU admission	Yes	4	57.1%	10	14.7%	14	0.006
	No	3	42.9%	58	85.3%	61	
# Normal; used as reference category							

DISCUSSION:

Doppler imaging had improved detection of the umbilical cord and its role has been validated and increased the accuracy of diagnosis. Nuchal cord (NC) is quite frequent finding at delivery However, the results of previous studies regarding the association between the NC and perinatal outcome were conflicting and the impact of NC on the maternal and fetal outcome still under debate [8,9].

loose NC was found to be the dominant type, seen in (90.7%) of nuchal cord , this goes with Rauf and Akhtar study who reported that (89.3%) of nuchal cord are loose [10].

Single loop NC was found in 85.4% of the cases while multiple loop was seen in14.6%, these figures go with Önderoğlu et al who mentioned that multiple loop NCs are less frequently seen in only (10.6%) of all neonates [11].

Presence of NC had increased the chance of cesarean sections, where (21.3%) of the pregnants with NC delivered by cesarean section compared to only (9.3%) of the controls, however, results of previous studies about the association between the presence of NC and frequency of cesarean section are conflicting, some found a significant association while other did not, Kashyap and Meena found in their study that nuchal cord is a potent factor for abnormal parameters during labour leading to cesarean section which indicated that NC indirectly increased the risk of cesarean section[12]. While Schaffer et al documented that the rate of deliveries by cesarean were not significantly increased in any nuchal cord group in term deliveries [13]. However, the conflicting results and differences between studies regarding the effect of nuchal cord on the rate of cesarean section might attributed to the difference in the distributions of numbers of nuchal cords or due to different management procedures on site, additionally, presence of some indications for cesarean section might overcome the effect of nuchal cord on the higher rate of cesarean deliveries.

Furthermore, we found that the pregnants in NC group were more likely to have prolonged first and second stage of labour than controls, about more than 2 folds more likely to have prolonged first or second stage of labour. The association between the NC and prolonged first stage was statistically insignificant (P= 0.47) while it was significant (P=0.039) with the second stage, this

indicated that the presence of NC could be a risk factor for the longer duration of labour. Narang et al also reported prolonged second stage in NC groups (single and multiple NC) compared to no NC (14). Conversely, in Switzerland Schaffer et al found no significant association between NC and duration of the second stage [13], and Ghi et al mentioned that the presence of NC does not seem to be among the factors affecting the labour duration ([15]. The differences between studies might be attributed to the differences in study designs, management procedures or sample size.

Fetal heart rate irregularities were more frequently seen among those with NC group and it is statistically significant.

Zahoor et al documented that the presence of a nuchal cord is a major cause of fetal distress, as evidenced by meconium stained amniotic fluid and/or fetal bradycardia or tachycardia [9], also Karunanidhi et al stated that nuchal cord loops are associated with increased fetal heart irregularities [16].

Meconium staining of liquor was found to be more frequent in NC group compared to controls but the difference was insignificant, this might be attributed to the small number of women with meconium stained liquor (11 cases and 7 controls).

These findings goes with Shrestha et al study who found that higher incidence of meconium staining of liquor in study group in comparison to control group (p = 0.05) but statistically not significant [8].

In the present study, we found that 2.5 folds increased risk to have neonates with lower Apgar score at 1 minute than controls, (odds ratio = 2.45, P=0.042) significantly more, while the difference in Apgar score at 5 min was statistically insignificant as only 5 neonates had Apgar score < 7 (3 in NC and 2 in control group). These findings consistent with the results of previous studies that found higher incidence of lower Apgar score at 1 minute in NC cases and most these studies showed no significant association between NC and not lower Apgar scores in 5 minutes [8,17].

More babies in NC group needed admittion to NICU compared to controls, (18.7% vs. 10.7%), respectively, nonetheless the difference didn't reach the statistical significance (P>0.05).

Peregrine et al [6] reported that the presence of a nuchal cord did not significantly increase the risk of lower Apgar score at 1 minute, 5 minute or admission to NICU. Similar findings were also reported by González-Quintero et al who found that there is no statistically significant difference between pregnants with sonographically detected nuchal cords and control cases in 5-minute Apgar scores, and neonatal intensive care unit admissions [18].

Regarding the neonatal weight, it is observed that the mean birth weight of babies in nuchal cord group was significantly lower than that of controls; 3.1± 0.3 (range: 2.5 – 4.0) vs. 3.3 ± 0.4 (range: 2.9 – 4) kg, respectively, (P= 0.004). It is often assumed that nuchal cord causes cord compression and this may lead to low birth weight and intrapartum complications [8].

Similar findings were also reported in previous studies where an association between NC and fetal weight decrease has been described [8,12] these studies referred that the markedly decreased fetal weights may be indicative of a prolonged nuchal cord persistence, leading to chronic mild fetal hypoxia [13], while others found no correlation between the NC and the birth weight [19,20].

Further analysis was made for the correlation of type of NC with respect to the mode of delivery and perinatal outcome, we revealed a significant correlation between tight NC and cesarean section rate, where 85.7% (6/7) of women in NC group delivered by cesarean section compared to only 14.7% (10/68) of those with loose NC (P<0.001). Furthermore, tight NC was significantly associated with prolonged second stage of labour (P=0.011), presence of FHR irregularities (P=0.001), more frequent Apgar score of < 7 at 1 minute (P=0.001) and at 5 minute (P=0.013) and more need for the admission to NICU (P=0.006). These findings are consistent with what reported in previous studies, Begum et al [21] documented that 85% (17/20) of those with tight NC delivered by cesarean section, most of the neonates born with tight nuchal cord also showed low Apgar score in 1 min, and by continuous electronic fetal heart rate monitoring it was found that tight nuchal loops were associated with persistent variable or late deceleration [21].

Singh et al found that tight cord around the neck may result in low Apgar scores and increased incidence of fetal distress and cesarean section [22]. From other point of view, Foumane et al from Cameroon found a significant association between tight nuchal cord and prolonged second stage of labor [23].

CONCLUSION:

Cord around fetal neck is associated with increased incidence of fetal distress, prolongation

of labour and increased cesarean section rate. Fetal outcome was found to be associated with higher incidence of low birth weight, low Apgar score at 1 minute, and at 5 minutes and more neonatal care unit admission.

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