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Original Research Article

## Study of perinatal outcome of fetuses with nuchal cord

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### ABSTRACT

**Background:** Entanglement of the umbilical cord around the foetal neck (nuchal cord) is a common finding at delivery, but its clinical relevance is not entirely clear. Nuchal cords have generally been considered to be rather benign. However, the insufficiency in data regarding the role of nuchal cord in foetal morbidity and mortality is a source of anxiety and frustration to both parturient and healthcare professionals. Considering the above facts the present study was taken up to establish the incidence of nuchal cord at delivery in the existing setup.

**Methods:** This was a cross sectional comparative study conducted over a period of one year from May 2013 to April 2014. A total of 362 women were selected for the study. These women were briefed about the nature of the study and a written informed consent was obtained. The demographic data and obstetrical history were documented on predesigned proforma. The data obtained was analysed using percentages and comparison done using chi-square test for discrete variables.

**Results:** Incidence of Nuchal Cord was 17.7% among study cases. Based on this study gestational age may have an effect on the presence of nuchal cord ( $p < 0.05$ ). Out of 64 cases with nuchal cord, 11.4% of cases had meconium stained liquor present. 9.8% of cases with nuchal cord had FHR irregularity, which was significantly less as compared to 20.0% of cases who did not show FHR irregularity. This was statistically significant. ( $p = 0.032$ ). 18.7% of mother who showed presence of nuchal cord had delivery by caesarean section. 22.7% of cases with nuchal cord had NICU admissions, which was insignificantly more as compared to 17.0% of cases who did not have NICU admissions.

**Conclusions:** Intrapartum events such as meconium staining of liquor and foetal heart rate irregularities were more commonly associated with nuchal cord but it did not affect the perinatal outcome. However, the mode of delivery was independent of the presence of nuchal cord, thereby reducing the morbidity to the mother. Hence nuchal cord is not associated with adverse perinatal outcomes and the presence of a nuchal cord per se is not found to be an indication of operative delivery.

**Keywords:** Foetal distress, Modes of delivery, Nuchal cord, Perinatal outcome

### INTRODUCTION

'Nuchal cord' has been defined as a  $\geq 360^\circ$  wrapping of the umbilical cord around the foetal neck. Entanglement of the umbilical cord around the foetal neck (nuchal cord) is a common finding at delivery, but its clinical relevance is not entirely clear.<sup>1</sup> Much like a hangman's noose, the nuchal cord is often blamed for problems that are

encountered during delivery and is often cited as a major cause of foetal distress, meconium stained liquor and perinatal mortality.

Foetal asphyxia, deflexion attitudes and malpresentations are the sequel of this complication as seen quoted in literature which may lead to operative intervention.<sup>2</sup> Nuchal cords have generally been considered to be rather

benign. Nevertheless, in light of non-reassuring foetal heart rate patterns during labour and increased umbilical artery acidemia in nuchal cords together with decreased birth weight, the question needs to be raised of whether detecting of nuchal cord at admission for delivery has to be followed expectantly or whether active planning of delivery strategies in term pregnancies with nuchal cords is reasonable.<sup>3</sup>

However, the insufficiency in data regarding the role of nuchal cord in foetal morbidity and mortality is a source of anxiety and frustration to both parturient and healthcare professionals. Ultrasound detected nuchal cords have misguided several obstetricians and this has indirectly increased the rate of patients being operated for elective caesarean sections.<sup>4</sup> Considering the above facts the present study was taken up to establish the incidence of nuchal cord at delivery in the existing setup, intrapartum complications and the perinatal outcome that occurs in babies born with nuchal cord.

Objectives of present study was to investigate the effect of nuchal cord on perinatal outcome, to study the incidence of nuchal cord, to assess the intrapartum complications associated with nuchal cord and to assess the perinatal outcome that occurs in babies born with nuchal cord.

## METHODS

The present study was conducted in the Department of Obstetrics and Gynaecology, Holy Family Hospital and Research Centre, Bandra (W), Mumbai, during the period of March 2013 to April 2014. This was a cross sectional comparative study. The present study utilised period sampling technique and all cases fitting into inclusion and exclusion criteria over a period of one year from May 2013 to April 2014 were selected for the study.

### *Sampling technique*

To assess the incidence of nuchal cord

Level of significance ( $\alpha$ ) = 5%; Power of analysis ( $\beta$ ) = 90%; Prevalence of Nuchal cord = 16.3%; N = 308 children; Considering Dropout of 15% N = 362

Based on the above estimates that is prevalence of Nuchal cord is 16.3%, a sample size of 362 patients would be sufficient to assess the objectives of study at 5% level of significance with 90% of Power.

### *Selection criteria for cases*

#### *Inclusion criteria*

- Singleton pregnancy (gestational age equal to or more than 28 weeks).
- Umbilical cord forming a loop around the neck of the baby.

#### *Exclusion criteria*

- Multiple gestations
- Pregnancies complicated with PIH, diabetes and other medical disorders of pregnancy.

### *Selection criteria for controls*

#### *Inclusion criteria*

- Singleton pregnancy (gestational age equal to or more than 28 weeks)
- Pregnancies with no loop of cord around neck.

#### *Exclusion criteria*

- Multiple gestations.
- Pregnancies complicated with PIH, diabetes, chorioamnionitis which can independently cause adverse perinatal outcome.

## *Methodology*

Ethical clearance was obtained from Institutional Ethics Committee of Holy Family Hospital and Research Centre, Bandra (W), Mumbai. Based on the selection criteria women delivering at Holy Family Hospital and Research Centre, Bandra (W), Mumbai, during the study period were screened for eligibility. A total of 362 women were selected for the study. These women were briefed about the nature of the study and a written informed consent was obtained. The demographic data and obstetrical history were documented on predesigned proforma.

These women were allowed to follow the course of labour and either delivered vaginally or by caesarean section (wherever indicated). At the time of birth, cord around the neck was noted. In babies with nuchal cord the type of loop that is tight or loose was noted. Nuchal cord was considered to be loose when it could be easily released before delivery of the foetal trunk and tight when it needed to be clamped and cut before delivery of the trunk. The number of loops were also documented.

The cases with nuchal cord at the time of delivery were taken as study group and the cases which did not have nuchal cord served as the comparative group.

The variables such as instrumental and caesarean section rate, meconium staining of liquor, Apgar score at one minute and five minutes and admission to neonatal intensive care unit (NICU) were taken as the outcome variables.

### *Statistical methods used for data analysis*

The data obtained was analysed using percentages and comparison done using chi-square test for discrete variables. Results are graphically represented where

deemed necessary. SPSS statistical software version 12.0 (Chicago Illinois, USA) was used for statistical analysis.

## RESULTS

As per our data, Incidence of Nuchal Cord was 17.7% among study cases. Loose loop of cord was found in 53.1% of cases and tight loop of cord was observed in 46.9% of cases. Of the total number of cases with nuchal cord (n=64), 81.2% of cases had 1 loop, 14.1% of cases had 2 loops, 3.1% of cases had 3 and 1.6% of cases had ≥4 loops.

**Table 1: Association between gestational age and nuchal cord among study cases.**

Gestational age (Wks)	With cord		Without cord	
	No.	%	No.	%
28-30 (N = 04)	-	-	004	100.0
31-33 (N = 15)	001	06.7	014	93.3
34-36 (N = 35)	004	11.4	031	88.6
36-39 (N = 211)	005	02.4	206	97.6
>40 (N = 49)	*06	12.2	043	87.8
P value	*0.020			

By Chi Square Test; \*Significant

In this study, 12.2% of cases with Nuchal cord had gestational age >40, which was significantly more as compared to 11.4%, 6.7% and 2.4% of cases who had gestational age of 34-36, 31-33 and 36-39 respectively.

Hence based on this study gestational age may have an effect on the presence of nuchal cord (p<0.05) (Table 1).

**Table 2: Association between meconium stained liquor and nuchal cord among study cases.**

MSL	With cord		Without cord	
	No.	%	No.	%
Present (N = 79)	009	11.4	070	88.6
Absent (N = 283)	055	19.4	228	80.6
P value	0.097 (NS)			

By Chi Square Test; NS = Not significant

Out of 64 cases with nuchal cord, 11.4% of cases had meconium stained liquor present, which was less as compared to 19.4% of cases who had meconium stained liquor absent, but the difference was not significant (p>0.05) (Table 2).

In the present study, 9.8% of cases with nuchal cord had FHR irregularity, which was significantly less as compared to 20.0% of cases who did not show FHR irregularity. This was statistically significant (p=0.032).

Comparing the modes of delivery, 18.7% of mother who showed presence of nuchal cord had delivery by caesarean section, which was comparable with 18.5% of mother who had a normal delivery, and it was more as compared to 9.1% of mother who had an instrumental

delivery but the difference was not statistically significant (p=0.398).

In the present study, 66.7% of mothers with nuchal cord who underwent instrumental delivery had meconium stained liquor, which was significantly more (p=0.009) as compared to 10.0% of cases who did not have a nuchal cord.

22.7% of cases with nuchal cord had NICU admissions, which was insignificantly more as compared to 17.0% of cases who did not have NICU admissions.

**Table 3: Association between APGAR score at 1 minutes and nuchal cord among study cases.**

APGAR score	With cord		Without cord	
	No.	%	No.	%
≤7 (N = 214)	041	19.2	173	80.8
>7 (N = 148)	023	15.5	125	84.5
P value	0.375 (NS)			

By Chi Square Test; NS = Not significant

Association between APGAR score at 1 minute showed 19.2% of cases with nuchal cord had score ≤7, which was insignificantly more as compared to 15.5% of cases who had APGAR >7 (p>0.05) (Table 3). Similarly, for APGAR score 5 minutes, 16.7% of cases with nuchal cord had Apgar score ≤7, which was comparable with 17.8% of cases who had Apgar >7 and the difference was not significant (Table 4).

**Table 4: Association between APGAR score at 5 minutes and nuchal cord among study cases.**

APGAR score	With cord		Without cord	
	No.	%	No.	%
≤7 (N = 36)	006	16.7	030	83.3
>7 (N = 326)	058	17.8	268	82.2
P value	0.155 (NS)			

By Chi Square Test; NS = Not significant

## DISCUSSION

A total of 362 women were selected for the study based on the selection criteria.

In the present study the incidence of nuchal cord was 17.7% of all the deliveries after 28 weeks of gestation. Incidence of multiple nuchal cords i.e. two or more entanglements was 18.8%.

The incidence of nuchal cord was comparable to previous studies with an average of 20.4%.<sup>1,3</sup> A cross sectional study conducted in 1995 by Larson, depicted that the incidence of nuchal cord increases from 5.8% at 20 weeks of gestation to 29% at 42 weeks.<sup>4</sup>

Incidence are slightly lower in studies done by Sheiner E et al (14.7%) and almost similar to studies conducted by

Peregrine et al and Mastrobattista et al which are, 18% and 17% respectively.<sup>2,5,6</sup> Schaffer et al in their study found the incidence to be 33.7% among term deliveries and 35.1% in post term deliveries.<sup>7</sup> Miser et al and Shrestha et al<sup>9</sup> observed a higher (24%) incidence.<sup>8</sup> This may probably be attributed to a larger number of patients observed in these studies leading to a higher incidence.

In this study the incidence of single and multiple (2 or more) loops of cord was 14.36% and 3.31%, respectively of the total deliveries (n=362) which is similar to studies done by Larson et al (3.8%) and Shreshtha et al (3.5%).<sup>4,9</sup> Incidence of multiple nuchal cords was 5.8% in term deliveries and 5.5% in post term deliveries in the study done by Schaffer et al.<sup>7</sup>

In this study it was observed that of the types of loops observed, loose loops were slightly more prevalent (53.1%) than tight loops (46.9%). In the study conducted by Shreshtha et al<sup>9</sup> the incidence of loose loops was significantly more (76.06%) compared to (23.93%) of tight loops. This may be attributed to observer variations. Tightness of a nuchal cord is more likely a spectrum rather than a dichotomous variable, but our charting calls for a decision to be made between 'tight', 'loose' and 'none'.

In the present study 12.2 % of the cases with gestational age >40 showed presence of nuchal cord, which was statistically significant when compared to other gestational groups. The study conducted by Larson involved 13,895 singleton deliveries and he determined that the presence of a nuchal cord linearly increased every week of gestation. He concluded nuchal cord appeared in 6% at 20 weeks to 29.0% at 42 weeks' gestation.<sup>4</sup>

Several studies have been conducted and have analysed the effect of nuchal cord on intrapartum events and neonatal outcomes with controversial results.

The study noted that meconium staining of liquor was present in 11.4% of cases with nuchal cord and in 19.4 % in the comparative group. Statistical analysis suggested that the difference was not significant (p=0.097).

In the present study fetal heart irregularities were seen in 9.8% of babies born with nuchal cord. Statistical analysis showed that nuchal cord is responsible for fetal heart irregularities (p=0.032), though this didn't alter the decision regarding the mode of delivery unless there was fetal distress.

The presence of a nuchal cord is often cited as a major cause of foetal distress, as evidenced by meconium stained amniotic fluid and/or foetal bradycardia or tachycardia. In a study by Fisher, foetal distress was twice as common in births complicated by nuchal a cord which is reverse of Spellacy et al who stated that the incidence of meconium is not increased by nuchal cords.<sup>10,11</sup> In a study conducted by Zahoor F et al, the

incidence of meconium staining was 4.3% and none of the cases had tachycardia or bradycardia which is consistent with our present study.<sup>12</sup>

Some authors have reported an increased prevalence of intrapartum foetal heart rate abnormalities, meconium staining and low Apgar scores in foetuses born with nuchal cord.<sup>2,4,9</sup>

Previous studies at large have been unable to establish a confirmed association between nuchal cord and increase in neonatal morbidity and mortality.

In the present study instrumental delivery was statistically not significant (p=0.398). These findings are in conflict with other similar studies.<sup>3</sup>

However, of the total number of cases who had instrumental deliveries 66% of the cases had meconium staining of liquor which was statistically significant (p=0.009).

The Caesarean section rate however was similar in both the groups and not statistically significant. In studies conducted by Shiener et al and Mastrobattista et al significantly lower caesarean section rate was seen, in women with nuchal cord. (p=0.398).<sup>2,6</sup>

In the present study Apgar score <7 at 1 minute was not significantly more in study group (p=0.375). This signifies that there is no birth asphyxia as a result of cord compression during labour. The Apgar score <7 at 5 minutes and admission to neonatal unit was not significantly more (p=0.155 and p=0.768 respectively), which means primary neonatal adaptation is not impaired by nuchal cord compression.

The findings are similar in the other studies conducted.<sup>4</sup> However in the study by Peregrine et al the presence of nuchal cord did not significantly increase the risk of Apgar score <7 at 1 minute.<sup>5</sup> In contrast to this, another study conducted, found that 5 minute Apgar score was <7 in significantly more foetuses without nuchal cord (p=0.004).<sup>9</sup>

## CONCLUSION

Entanglement of the umbilical cord around the foetal neck is a common finding at delivery, but its clinical relevance not entirely understood. Although the nuchal cord is often blamed for most of the problems encountered during delivery, the actual significance that a nuchal cord has on the intrapartum events and perinatal outcome is controversial. Several studies have analysed deliveries with nuchal cord with differing results. In the present study the incidence of nuchal cord was 17.7%. When compared to other studies it is almost comparable.

Intrapartum events such as meconium staining of liquor and foetal heart rate irregularities were more commonly

associated with nuchal cord but it did not affect the perinatal outcome. However, the mode of delivery was independent of the presence of nuchal cord, thereby reducing the morbidity to the mother. Perinatal outcome as seen by the Apgar score and rate of NICU admission was also not statistically significant.

Hence nuchal cord is not associated with adverse perinatal outcomes. The presence of a nuchal cord per se is not found to be an indication of operative delivery. However, such patients require close monitoring during labour, preferably by continuous foetal electronic heart rate monitoring as tight and multiple nuchal loops were associated with persistent variable or late deceleration. Real time ultrasonic equipment, colour Doppler sonography, in some cases pulsed Doppler sonography of the cord vessels is now indicated in situations with uncertain variable deceleration and /or other abnormal findings in the antepartum foetal heart rate registration. Findings of this study suggest that vaginal delivery can be attempted in spite of this ultrasonographic awareness. This will eliminate unnecessary caesarean deliveries thereby reducing maternal morbidity and prolonged hospital stay. However further studies are required to determine if there are long term complications of nuchal cord on newborns.

Limitation of present study was that an antenatal ultrasound was not performed prior to delivery. The newborns were observed only at the time of the delivery and the NICU admission was noted

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