

## NUCHAL CORD AND PERINATAL OUTCOME IN A RURAL HOSPITAL: A CASE CONTROL STUDY

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### ABSTRACT

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#### BACKGROUND

Entanglement of umbilical cord around the foetal neck (Nuchal cord) is a common finding at delivery. It is often assumed that nuchal cord causes cord compression and thus low birth weight and is often cited as major cause of foetal distress, intrapartum complications and perinatal mortality.

#### AIMS

To study the pregnancy outcome and neonatal outcome at a rural hospital in patients with nuchal cord and to compare them with those without nuchal cord.

#### SETTINGS AND DESIGN

This was a prospective, case control study conducted between January 2015 to December 2015 in the Department of Obstetrics and Gynaecology, S.M.B.T. Institute of Medical Sciences, Dhamangaon, Nashik.

#### METHODS AND MATERIAL

Pregnant women with singleton pregnancy and vertex presentation who delivered after 37 weeks of gestational age were enrolled in the study. Total 100 patients were selected; 50 pregnant women with nuchal cord diagnosed by ultrasound Doppler at 35 to 40 weeks of gestation were assigned as cases and 50 pregnant women without nuchal cord were assigned as controls. The management of the cases and controls were done according to the hospital labour protocols. Their labour events and outcomes were noted.

#### STATISTICAL ANALYSIS USED

Statistical analysis was done using two sample test and chi-square test.

#### RESULTS

We found no statistical significant difference in case and control groups with respect to mode of delivery, APGAR score at 1 min, need for neonatal intervention and neonatal outcome. However, mean birth weight in nuchal cord group was found to be less and statistically significant increased cord length in nuchal cord group was found.

#### CONCLUSIONS

Nuchal cord does not affect the mode of delivery, neonatal outcome, NICU admissions and neonatal interventions. However, nuchal cord is associated with longer umbilical cord and lower birth weight.

#### KEYWORDS

Nuchal Cord, Perinatal Outcome, Pregnancy Outcome.

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#### INTRODUCTION

The nuchal cord is blamed for problems encountered during labour and delivery and is often cited as major cause of foetal distress and perinatal mortality. However, the actual significance of nuchal cord on the outcome of an infant is controversial.

Entanglement of umbilical cord around the foetal neck (Nuchal cord) is a common finding at delivery. In 1962, J. Selwyn Crawford MD from the British Research Council defined nuchal cord as cord 360 degrees around the foetal neck.

It is often assumed that nuchal cord causes cord compression and thus low birth weight and intrapartum complications.

The assumption that nuchal cord entanglement could cause cord compression and thus intrapartum complication is not recent. In 1896, Gould<sup>1</sup> mentioned Hippocrates' references on nuchal cord. Hippocrates described in the "DeOctimestri Partu" the nuchal and chest coiling of umbilical cord and regarded it as "One of the great dangers of the eighth month."

If the umbilical cord becomes overstretched or compressed during labour, it usually leads to foetal bradycardia temporarily. These brief "variable heart rate decelerations" are not harmful. However, if the foetal heart rate slows to below 100 beats per minute and does not return to normal (120 to 160 for most babies) within a few minutes measures need to be taken to relieve the presumed cord compression. This includes giving oxygen, fluid and left lateral position to the mother.

Tocolytics may be given to slow down the contractions. If

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it is still not relieved, a caesarean delivery may be considered. This study was done to find out the pregnancy outcome.

**AIMS AND OBJECTIVES**

To study and compare the pregnancy outcome in patients with nuchal cord and to compare them with those without nuchal cord in terms of normal vaginal delivery, instrumental delivery and caesarean section.

To study and compare the neonatal outcome in patients with nuchal cord and to compare them with those without nuchal cord.

To study Cord Parameters like length, number of loops, whether tight or loose in patients with nuchal cord and to compare them with those without nuchal cord.

**MATERIAL AND METHODS**

This was a prospective, case control study conducted between January 2015 to December 2015 in the Department of Obstetrics and Gynaecology, S.M.B.T. Institute of Medical Sciences, Dhamangaon, Nashik.

Pregnant women with singleton pregnancy and vertex presentation who delivered after 37 weeks of gestational age were enrolled in the study. Total 100 patients were selected; 50 pregnant women with nuchal cord diagnosed by ultrasound Doppler at 35 to 40 weeks of gestation and confirmed at delivery were assigned as cases (3 false positive cases with presence of nuchal cord on antenatal USG, but absent at delivery were excluded) and 50 pregnant women without nuchal cord were assigned as controls. Following patients were excluded from study non-vertex presentations, Contracted pelvis or cephalopelvic disproportion, Placenta previa, Placental abruption, Previous caesarean section, Fibroid or pelvic mass complicating pregnancy, Rh negative pregnancies, Hypertensive disorders of pregnancy, Medical or Gynaecological disorders with pregnancy, Bad obstetric history, No ultrasound scan at 35-40 weeks of gestation, Polyhydramnios and oligohydramnios.

The management of the cases and controls were done according to the hospital protocol. Their labour events like foetal heart rate irregularities, mode of delivery, presence of nuchal cord and its number of loops, cord length from its insertion on placenta up to the umbilicus, whether loose or tight, birth weight, APGAR score at 1 minute and 5 minutes and admission to neonatal unit, need for intervention, days of stay in NICU, neonatal death were noted. A nuchal cord was considered to be loose when it could be easily uncoiled before delivery of the foetal trunk. When it needed to be clamped and cut before delivery of trunk, the nuchal cord was considered tight.

Foetal Heart Rate (FHR) monitoring was done with intermittent auscultation with stethoscope and hand held Doppler every 30 minutes in first stage of labour and after each contraction in second stage of labour. When any FHR irregularities were encountered, foetal heart rate was monitored with continuous electronic foetal monitoring. Persistent FHR irregularities (<110/minute and >180/minute) for 10 minutes or persistent late or variable decelerations with electronic monitoring of foetal heart was considered as a sign of foetal distress. FHR irregularities lasting for less than 10 minutes was termed as transient FHR irregularities.

Variables like transient Foetal Heart Rate (FHR)

irregularities, foetal distress, instrumental delivery rate, caesarean section rate, Apgar score at 1 minute and 5 minutes and admission to neonatal unit, need for intervention, days of stay in NICU, neonatal death were taken as outcome variable. Outcome variables between the study group and control group were compared.

Statistical analysis was done using two sample test for continuous variables and chi-square test for discrete variables. Statistical significance was determined at the 5% level of significance (p<0.05).

**RESULTS**

|                  |                         | Cases     | Control   | Total      |
|------------------|-------------------------|-----------|-----------|------------|
| Mode of Delivery | Normal Vaginal Delivery | 34<br>68% | 37<br>74% | 71<br>71%  |
|                  | Instrumental Delivers   | 3<br>6%   | 2<br>4%   | 5<br>5%    |
|                  | Caesarean Section       | 13<br>26% | 11<br>22% | 24<br>24%  |
| <b>Total</b>     |                         | <b>50</b> | <b>50</b> | <b>100</b> |

*Table 1: Pregnancy Outcome*

In our study, there was no statistical difference in frequency of primary caesarean sections or instrumental deliveries between the two groups. P value 0.493 (chi-square test).

|         |              | Cases     | Controls  | Total      |
|---------|--------------|-----------|-----------|------------|
| Stage-1 | <110         | 14        | 12        | 26         |
|         | >110         | 36        | 38        | 74         |
|         | <b>Total</b> | <b>50</b> | <b>50</b> | <b>100</b> |

*Table 2: Intrapartum Foetal Heart Rate*

In our study, there was no statistical difference in the Intrapartum foetal heart rate during 1<sup>st</sup> stage of P value -0.345 (Not significant).

|              |               | APGAR Score     |            | Total |
|--------------|---------------|-----------------|------------|-------|
|              |               | <7              | >7         |       |
| Cases        | 4 (8%)        | 46 (92%)        | 50         |       |
| Controls     | 2 (4%)        | 48 (96%)        | 50         |       |
| <b>Total</b> | <b>6 (6%)</b> | <b>94 (94%)</b> | <b>100</b> |       |

*Table 3: APGAR Score at 1 Minute*

In our study, there was no statistical difference was found in the Apgar score at 1 min both the groups. P value 0.678. (p>0.05).

|              |          | APGAR Score |            | Total |
|--------------|----------|-------------|------------|-------|
|              |          | <7          | >7         |       |
| Cases        | 0        | 50          | 50         |       |
| Controls     | 0        | 50          | 50         |       |
| <b>Total</b> | <b>0</b> | <b>100</b>  | <b>100</b> |       |

*Table 4: APGAR Score at 5 Minutes*

We observed that no neonates were found to have Apgar score <7 at 5 minutes in both nuchal cord and non-nuchal group.

|              |           | Admission in NICU |            | Total |
|--------------|-----------|-------------------|------------|-------|
|              |           | Yes               | No         |       |
| Cases        | 8         | 42                | 50         |       |
|              | 16%       | 84%               | 100%       |       |
| Controls     | 5         | 45%               | 50         |       |
|              | 10%       | 90%               | 100%       |       |
| <b>Total</b> | <b>13</b> | <b>87</b>         | <b>100</b> |       |

*Table 5: Admission Rate in NICU*

Total 13 neonates admitted in NICU; 8 (16%) from nuchal cord group (4 neonates for perinatal asphyxia, 2 neonates for

transient tachypnoea of newborn and 2 neonates for low birth weight), and 5(10%) from non-nuchal cord group (3 neonates for perinatal asphyxia, 1 neonate for transient tachypnoea of newborn and 1 neonate for VSD). Admission rate in nuchal cord group was more than non-nuchal cord group, but no statistical difference was found between the two. (P value -0.554).

|          | Days of Stay in NICU |        |       | Total |
|----------|----------------------|--------|-------|-------|
|          | Day- 1               | Day- 2 | Day-3 |       |
| Cases    | 5                    | 2      | 1     | 8     |
|          | 10%                  | 4%     | 2%    |       |
| Controls | 3                    | 2      | -     | 5     |
|          | 6%                   | 4%     | -     |       |

**Table 6: Days of Stay in NICU**

Increased days of stay in NICU was statistically not significant. (P value 0.659).

|              | Need for Neonatal Intervention |            | Total       |
|--------------|--------------------------------|------------|-------------|
|              | Yes                            | No         |             |
| Cases        | 6                              | 44         | 50          |
|              | 12%                            | 88%        |             |
| Controls     | 3                              | 47         | 50          |
|              | 6%                             | 94%        |             |
| <b>Total</b> | <b>9</b>                       | <b>91</b>  | <b>100</b>  |
|              | <b>9%</b>                      | <b>91%</b> | <b>100%</b> |

**Table 7: Need for Neonatal Interventions**

6 neonates from nuchal cord group needed intervention, while 3 from non-nuchal cord group. Need for intervention increased in cases compared to controls. This difference is also statistically not significant.

Incidence of tight cord was 34% (17) and loose cord was 66% (34).

| Number of Loops of Cord | 1 Loop    | 40          | 80% |
|-------------------------|-----------|-------------|-----|
|                         | 2 Loops   | 10          | 20% |
| 3 Loops                 | 0         | 0%          |     |
| <b>Total</b>            | <b>50</b> | <b>100%</b> |     |

**Table 8: Incidence of Number of Loops of Cord**

Incidence of 1 cord loop 40 (80%), 2 loops 10 (20%) in our study sample.

|         | Mean Birth Weight | T test (P value) |
|---------|-------------------|------------------|
| Cases   | 2.927             | 0.009            |
| Control | 3.127             |                  |

**Table 9: Comparison of Mean Birth Weight**

Mean birth weight in non-nuchal cord group 3.127 kgs, in nuchal cord group 2.927 kgs. We observed that birth weight in nuchal cord group was 200 grams less than non-nuchal cord group, which is statistically significant.

|          | Mean Cord Length | T test P value |
|----------|------------------|----------------|
| Cases    | 68.02 cms        | 0.009          |
| Controls | 58.64 cms        |                |

**Table 10: Comparison of Cord Length**

Mean umbilical cord length in non-nuchal cord group is 58.64 cms, nuchal cord group 68.02 cms. Cord is longer when it is wrapped around neck as compared to non-nuchal cord

group. Statistically significant increased cord length was observed.

|       | Vaginal Delivery | Instrumental Delivery | Caesarean Section | Total |
|-------|------------------|-----------------------|-------------------|-------|
| Tight | 7                | 2                     | 8                 | 17    |
|       | 41.20%           | 11.80%                | 47.10%            |       |
| Loose | 27               | 1                     | 5                 | 33    |
|       | 81.80%           | 3%                    | 15.20%            |       |

**Table 11: Tight/Loose Cord & Its Relation to Mode of Delivery**

We observed that though there is increased in caesarean section rate and instrumental delivery rate when cord was tightly wrapped around the neck, it was not statistically significant.

| No. of Loops | Vaginal Delivery | Instrumental Delivery | Caesarean Section | Total |
|--------------|------------------|-----------------------|-------------------|-------|
| 1 Loop       | 27               | 1                     | 12                | 40    |
|              | 67.50%           | 2.50%                 | 30%               |       |
| 2 Loops      | 7                | 2                     | 1                 | 10    |
|              | 70%              | 20%                   | 10%               |       |

**Table 12: Number of Loops of Cord & Its Effect on Mode of Delivery**

Statistically, no significant effect on mode of delivery was observed. (P value - 0.151).

**DISCUSSION**

In our study nuchal cord group was found to have normal vaginal deliveries 34 (68%), instrumental deliveries 3 (6%), caesarean section rate was 13 (26%). In non-nuchal group, normal vaginal deliveries 37 (74%). And no statistical difference was found between the two groups. The presence of a nuchal cord in this study was not associated with an increased frequency of primary caesarean section, vacuum or forceps deliveries. Thus, operative deliveries were not more common in those pregnancies involving nuchal cords.<sup>2</sup>, although this is controversial in the literature.<sup>3,4,5</sup>

The presence of a nuchal cord is often cited as a major cause of foetal distress, as evidenced by meconium stained amniotic fluid or foetal bradycardia or tachycardia.<sup>4,5</sup> In our study, intrapartum foetal heart rate during 1<sup>st</sup> stage of labour <110 beats per minute observed in 14 (28%) patients in nuchal cord group and 12 (24%) patients in non-nuchal cord group. FHR pattern normal, i.e. >110 bpm in 36 (78%) patients in case group and 38 (76%) patients in control group. This increase in incidence of foetal distress was not statistically significant, which has been confirmed in recent studies.<sup>2,6</sup>

An interesting finding in this study is that infants born with nuchal cords weighed less than those in the control group. The difference of 200 grams was statistically significant (P<.005), although the clinical significance of this finding is unclear. The nuchal cord group had significantly fewer macrosomic and large-for-gestational-age infants as compared with the control group (P<0.5). In a study conducted by William F. Miser,<sup>7</sup> they found that nuchal cord group showed neonates weighing 123 grams less than non-nuchal cord group significance of nuchal cords on intrauterine growth.

Some studies have shown that the increased length of the umbilical cord predisposes an infant to a nuchal cord. The

average umbilical cord length is 50 to 58 cm with longest reported cord measuring 175 cm.<sup>8</sup> Longer cords tend to become looped around the neck.<sup>8</sup> Nuchal coiling can occur in shorter cords, in which cases the cord tends to be more tightly wrapped around the infant's neck.<sup>5</sup> In our study mean umbilical cord length in non-nuchal cord group is 58.64 cms, nuchal cord group 68.02 cms which is statistically significant ( $P < 0.05$ ). Cord is usually longer when wrapped around neck.

Larson and Colleagues noted that among 8565 deliveries, the frequency of two or more cord entanglements at delivery was 3.8%. Compared with single or no cord entanglement, pregnancies with multiple nuchal cords were significantly more likely to have meconium-stained amniotic fluid, an abnormal foetal heart rate pattern during advanced labour, operative vaginal delivery, low 1-min Apgar scores and mild umbilical artery acidosis at birth.<sup>9</sup> In present study, we studied the mode of delivery with two or more loops of cord around neck. We found 1 loop of cord in 40 cases; 27 delivered vaginally, 1 had instrumental delivery and 12 had caesarean sections. Out of 10 cases with 2 loops of nuchal cord 7 delivered vaginally, 2 had instrumental deliveries, 1 underwent caesarean section. No significant difference was found between two groups. Further, studies are needed to conclude that number of loops of cord does not affect mode of delivery.

Shrestha NS, Singh N.<sup>10</sup> conducted cross-sectional study at Kathmandu Medical College Teaching Hospital (KMCTH) between March 2006 and September 2006. They observed that Neonatal Unit admission was needed by 24.78% of newborn in study group and 18.48% in control group, not reaching statistical significance. In our study, total 13 neonates admitted in NICU; 8 (16%) from nuchal cord group and 5 (10%) from non-nuchal cord group. No statistical difference was found between the two groups. Neonates born with nuchal cord were not at increased risk of NICU admission.

8 neonates admitted in NICU from nuchal cord group; 5 neonates for 1 day, 3 for 2 days and 1 for 3 days kept in NICU; 5 neonates admitted in NICU from non-nuchal cord group; 3 neonates for 1 day and 2 for 2 days were kept in NICU. Perinatal asphyxia was the most common cause of NICU admissions in both groups, but no statistical difference noted between the two groups.<sup>11</sup> Nuchal cord does not increase admission rate in NICU; 6 neonates from nuchal cord group needed intervention, while 3 from non-nuchal cord group. No statistical difference was found. Nuchal cord does not increase need for neonatal intervention. Several studies have shown that this cord compression results in reduced blood flow to the foetus and subsequent changes in the umbilical artery blood gases.<sup>3</sup> If compression is high enough to occlude the artery, the foetus is unable to exchange carbon dioxide adequately, resulting in hypercapnia and subsequent acidosis. Acidosis is significant, more common in newborns with nuchal cords. This acidosis is corrected quickly by prompt ventilation of the newborn.

Paradoxically, despite the higher incidence of bradycardia and acidosis, the Apgar score is not dramatically affected. Study conducted by William F. Miser.<sup>7</sup> was unable to demonstrate a significant difference in the mean 1-minute Apgar score between the two groups, although the nuchal cord group did tend to have a larger percentage of infants born with a score of less than 7. This difference was absent at 5 minutes after birth when the second Apgar score was given, suggesting

that any possible effect is only transient. Similar finding by other suggest that nuchal cords are not a major cause of foetal asphyxia.<sup>3</sup>

In our study, Nuchal cord of any turns was not shown to be associated with intrauterine death or neonatal death.<sup>12</sup>; however, in our study we observed that 4 neonates from nuchal cord group and 2 from non-nuchal cord group had Apgar score less than 7 at 1 minute. No statistical difference was found between the two groups, although much higher occurrence of low Apgar scores at 1 min in neonates with nuchal cord. It is interesting to note that the Apgar scores in the nuchal cord group of this study were comparable to those of the control group, despite the higher occurrence of foetal distress noted during labour. It may be that the Apgar score is a better indicator of the newborn's health at the time of birth than the fluctuations in heart rate noted during labour.

### CONCLUSIONS

With advance in ultrasound, detection of nuchal cord has increased causing undue anxiety in patients and obstetricians. With references to other studies, our study reassured that nuchal cord does not affect the mode of delivery and neonatal outcome. Though we observed that nuchal cord is responsible for reduction in birth weight, further studies are required to come to a definite conclusion. Tight nuchal cord and increased number of loops of nuchal cord does not affect the mode of delivery. Nuchal cord does not increase the admission rate in NICU, need for neonatal interventions and days of stay in NICU as compared to non-nuchal cord group.

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