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Prospective Observational Study Of The Outcome Of Pregnancies With Sonologically Detected Nuchal Cord At Term

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Abstract:
Background*: Nuchal cord refers to the condition where the umbilical cord wraps around the fetal neck, potentially leading to complications during pregnancy and delivery. The prevalence of nuchal cords at delivery ranges between 6% and 37%, with possible adverse outcomes including fetal asphyxia, hypoxia, and in severe cases, stillbirth. The current study aims to evaluate the impact of nuchal cord detection via ultrasound in full-term pregnancies and assess its prognostic significance concerning perinatal outcomes.*
Materials and Methods: *This prospective observational study involved a cohort of pregnant women at term (37-42 weeks of gestation) with sonologically detected nuchal cords. Ultrasound evaluations were conducted to determine the presence and characteristics of nuchal cords, including the number of loops and tightness. The outcomes measured included the mode of delivery, fetal distress, Apgar scores, and neonatal complications such as hypoxic-ischemic encephalopathy (HIE) and meconium aspiration syndrome (MAS). Statistical analysis was performed to assess the correlation between nuchal cord characteristics and perinatal outcomes*.
Results: *The study found that the presence of nuchal cords was associated with an increased rate of cesarean deliveries and a higher incidence of fetal distress during labor. However, the degree of tightness and the number of loops significantly influenced the severity of outcomes. Neonates with tightly looped nuchal cords showed a higher incidence of low Apgar scores and required more intensive neonatal care. The study also observed a slight increase in the occurrence of neonatal complications, including MAS and HIE, among those with multiple nuchal cord loops.*
Conclusion: *The detection of nuchal cords at term via ultrasound is a valuable tool in predicting potential delivery complications. While many nuchal cords do not adversely affect perinatal outcomes, those with multiple loops or tight cords pose a higher risk of complications. This study emphasizes the importance of careful monitoring and tailored management strategies for pregnancies complicated by nuchal cords to optimize maternal and fetal outcomes.*
Keywords: *Nuchal cord, umbilical cord, fetal distress, perinatal outcomes, ultrasound, pregnancy, cesarean delivery, neonatal complications, hypoxic-ischemic encephalopathy, meconium aspiration syndrome, labor induction.*

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I. Introduction

The umbilical cord around the neck, or nuchal cord, refers to the condition where the umbilical cord wraps completely (360 degrees) around the fetal neck. The occurrence of true knot of umbilical cord is very rare. It may be defined as entwining of a segment of umbilical cord, usually without obstructing fetal circulation and commonly result from fetal slippage through a loop of the cord[1] . Although the reported incidence of true knots of umbilical cords ranges from 0.3% to 2% .This can involve one or more loops of varying tightness. At delivery, the occurrence of nuchal cord is about 22.7%[2]. The incidence is relatively low before 20 weeks of gestation due to the shorter length of the umbilical cord compared to the fetal body, reducing the likelihood of wrapping around the neck or body[3].

The umbilical cord begins developing around week 3 of gestation from the connecting stalk and integrates with the omphalomesenteric duct, reaching full development by week 7. It consists of two umbilical arteries, one umbilical vein, the vitelline duct, and Wharton's jelly, all encased in an amniotic membrane. The primary role of the umbilical cord is to transport blood to and from the fetus. deoxygenated blood flows away from the fetus through the umbilical arteries to the placenta, while oxygenated blood returns to the fetus via the umbilical vein. During the second trimester, the cord elongates, averaging 40-50 cm in length and 2 cm in diameter with about 40 helical turns.

Umbilical cord abnormalities include changes in morphology and placental insertion, in utero distortions, vessel count anomalies, blood flow irregularities, and cystic or solid masses. Notable in utero distortions are cord knots, torsion, nuchal cords, and entanglements, particularly in cases of monoamniotic twins. Cord knots typically form loops that tighten and interlace, and are most common between 9 and 12 weeks of gestation, though they can also develop during labour.

Types of knots include true knots, false knots, and loose knots. False knots are benign kinks, while true knots are tightened before labour and are more concerning. The incidence of true umbilical knots ranges from 0.3-2%, with higher rates associated with polyhydramnios, small fetus size, gestational diabetes, and male fetuses.

True umbilical knots can lead to complications such as reduced blood flow, fetal asphyxia, and death. Ultrasound is typically used for diagnosis, though knots can sometimes be missed, increasing the risk of complications. Management depends on the knot's tightness and fetal heart rate monitoring, with indications of fetal hypoxia often necessitating a cesarean section.

A nuchal cord is defined as the umbilical cord looping 360 degrees around the fetal neck. Its prevalence at delivery ranges from 6% to 37%. Shui and Eastman reported that in a study of 1,007 deliveries, a single loop occurred in 20.6% of cases, double loops in 2.5%, and triple loops in 0.2%. There have been reports of up to nine loops around the neck. The occurrence of nuchal cords tends to increase throughout gestation and may significantly rise beyond 38 weeks. Around 25-50% of nuchal cords resolve before delivery, and up to 60% of fetuses may have a nuchal cord at some point during pregnancy.

The incidence of nuchal cord varies across studies, with rates generally between 10% and 30%. Risk factors include advanced maternal age, multiparity, and male newborns, though their significance remains inconsistent. The exact cause of nuchal cord is unclear, but factors such as excessive fetal movement, abnormal fetal or cord growth, vascular issues, insufficient tensile strength, and polyhydramnios or oligohydramnios are often implicated. Nuchal cords are typically diagnosed via ultrasound, which can detect the characteristic divot sign and abnormal blood flow velocities.

While nuchal cord can be detected during prenatal ultrasound, the impact on perinatal outcomes remains uncertain. Although nuchal cords usually do not affect outcomes, variability in tightness may contribute to this uncertainty. A quantitative assessment of nuchal cord tightness during pregnancy could help in predicting potential problems. Therefore, a prospective study aims to identify ultrasonic indicators of nuchal cord tightness, evaluate the risk of fetal distress, and assess whether nuchal cord tightness affects labour and delivery outcomes.

While many nuchal cords have no significant clinical effects, recent reports link their presence to adverse maternal and fetal outcomes, with correlations to cord tightness and the number of loops. A tight nuchal cord can compress the umbilical vein, leading to effects similar to strangulation, such as hypoxia, anemia, and acidosis. Physical signs in affected infants may include facial petechiae, conjunctival and retinal hemorrhages, pallor, and, in severe cases, respiratory distress, hypotonia, and resuscitation needs. Autopsy studies confirm significant hypoxia in stillbirths associated with nuchal cords, and such cords have been associated with an increased risk of preterm labour and cesarean delivery.

This study investigates the relationship between nuchal cord detection during labour and perinatal outcomes in full-term pregnancies.

II. Material And Method

The present study is a prospective observational Study was carried out in the Department of obstetrics and gynaecology in Dr B R Ambedkar Medical College and Hospital. The study is conducted on 150 patients.

Study design: Prospective observational Study.

Study location: This was tertiary care teaching hospital based study done in Dr B R Ambedkar Medical College and Hospital, Bangalore.

Study duration: The study is carried out for a period of 12 months, i.e., from 1st october 2022 to 30th September 2023.

Sample size: 150 patients.

Inclusion criteria:

1. Singleton
2. Term
3. Gestational age of 37 to 42 weeks as determined from the date of the last menstrual period and confirmed by ultrasonographic measurements in the first trimester
4. Cephalic presentation

5. Live
6. Women of age group >18 to 34years

Exclusion criteria:
1. Pregnant women who deny to give consent
2. History of antepartum hemorrhage
3. Women more than 35 years
4. Premature rupture of membranes/PPROM
5. Intrauterine death of fetus
6. Any obstetric surgeries

Statistical analysis

The collected data was entered into Microsoft Excel Worksheet-2010 and data was taken into IBM SPSS Statistic for windows, version 24 (IBM Corp., Armonk, N.Y., USA) software for calculation of frequency, percentage, mean, standard deviation and probability value. Qualitative data was represented in the form of frequency and percentage. Association between qualitative variables was assessed by Chi Square test with continuity correction, fisher's exact test for all 2 x 2 tables, where P value of chi square test was not valid due to small counts. Quantitative data was represented using mean and standard deviation. Analysis of quantitative data within the groups was done using paired t test if data passes 'Normality test'.

One Way Analysis (ANOVA) was used to compare more than two groups. A 'P' value of <0.05 was considered statistically significant.

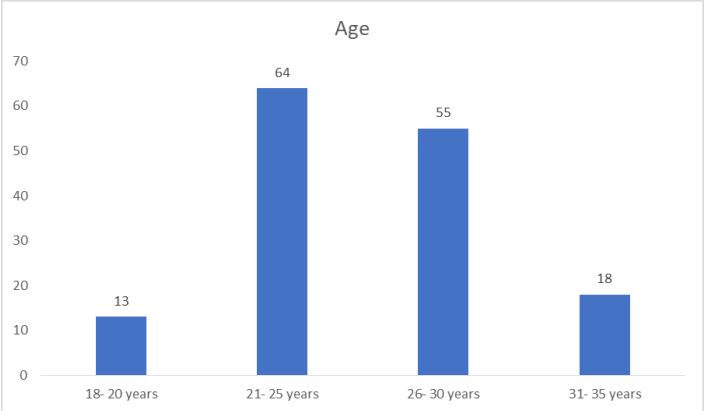
III. Results

The table 1 shows the distribution according to age were 8.7% were between 18- 20 years, 42.7% were between 21 to 25 years, 36.7% were between 26 and 30 years and 12% were between 31- 35 years. The mean age was 25.7± 1.9 years

Table No 01. Distribution of subjects according to age

Age	Frequency	Percent
18- 20 years	13	8.7%
21- 25 years	64	42.7%
26- 30 years	55	36.6%
31- 35 years	18	12%
Total	150	100%
Mean age: **25.7± 1.9 years**		

Figure 1: Column chart showing age

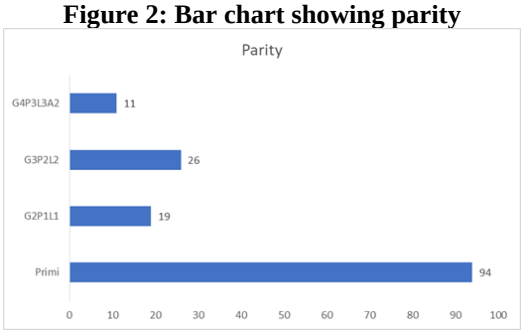


The table 2 shows the parity were 62.7% (n= 94) were primi's and the remaining 37.3% (n= 56) were multi- gravidas.

Table No 02. Distribution according to parity

Parity	Frequency	Percent
Primi	94	62.7%
$G_2P_1L_1$	19	12.7%
$G_3P_2L_2$	26	17.3%
$G_4P_3L_3A_2$	11	7.3%
Total	150	100%

Figure 2: Bar chart showing parity

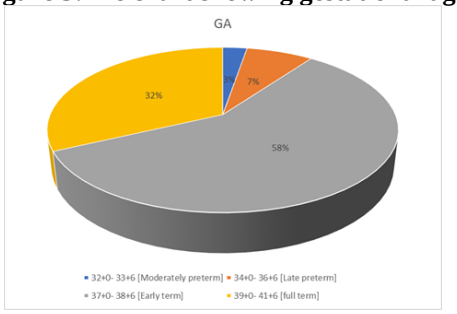


The table 3 shows the gestational age were 58% were early term, 32% were full term, 7.3% were early term and 2.7% were moderately early term.

Table No 03. Distribution according to gestational age

Gestational age	Frequency	Percent
32+0- 33+6 [Moderately preterm]	4	2.7%
34+0- 36+6 [Late preterm]	11	7.3%
37+0- 38+6 [Early term]	87	58%
39+0- 41+6 [full term]	48	32%
Total	150	100%

Figure 3: Pie chart showing gestational age

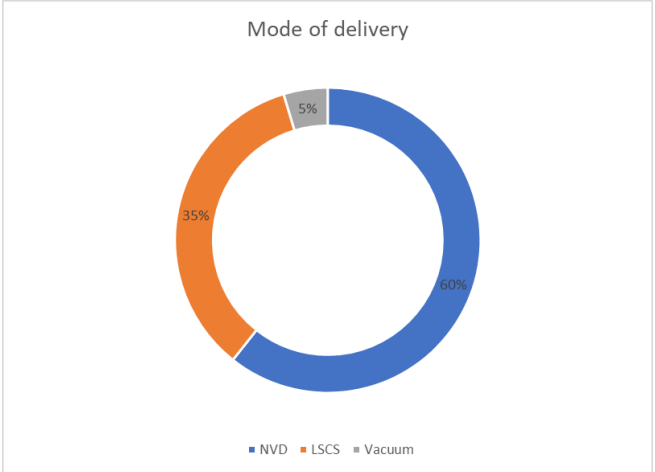


The table 4 The mode of delivery was normal vaginal delivery in 60.7%, caesarean section in 34.7% and 4.7% vacuum was used

Table No 04. Distribution according to mode of delivery

Mode of delivery	Frequency	Percent
NVD	91	60.7%
LSCS	52	34.7%
Vacuum	7	4.7%
Total	150	100%

Figure 4: Pie chart showing mode of delivery

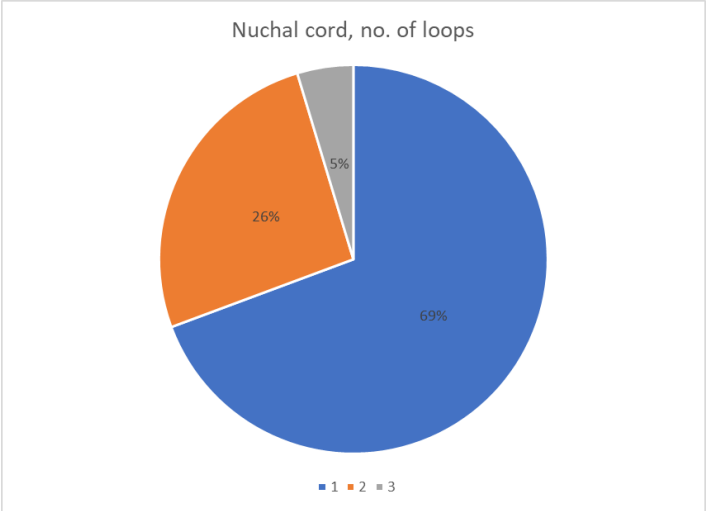


The table 5 shows the ultrasonography of the cord were, it ws one loop around the neck in 69.3%, two loops in 26% and 3 loops in 4.7%.

Table No 05. Ultrasonography findings of nuchal cord

No. of loops	Frequency	Percent
1	104	69.3%
2	39	26%
3	7	4.7%
Total	150	100%

Figure 5: Pie chart showing nuchal cord on USG

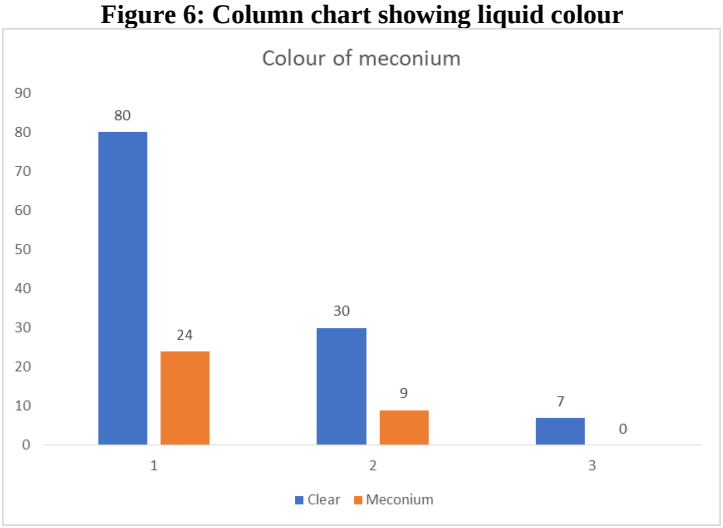


The table 6 The liquid was meconium stained in 34 and 9 for one and two loops around the neck respectively as seen in table

Table No 06. Colour of liquid according to nuchal cord findings

Loops	Colour of liquid	Frequency/ percent
1 (n= 104)	Clear Meconium	80 (76.9%) 24 (23.1%)
2 (n= 39)	Clear Meconium	30 (76.9%) 9 (23.1%)
3 (n= 7)	Clear Meconium	7 (100%) -

Figure 6: Column chart showing liquid colour

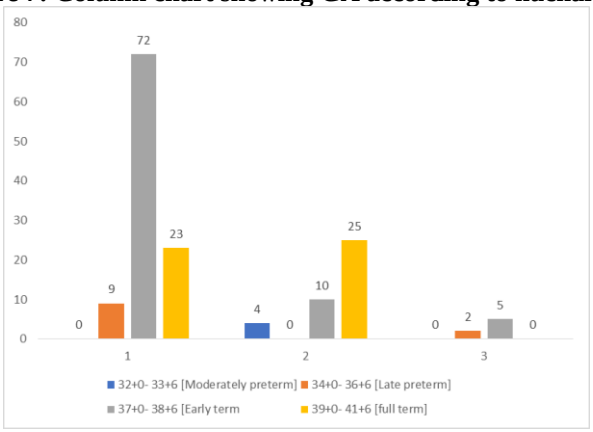


The table 7 shows the gestational age of the babies based on the number of loops.

Table No 07. Gestational age according to nuchal cord findings

Loops	GA	Frequency/ percent
1(n= 104)	32+0- 33+6 [Moderately preterm] 34+0- 36+6 [Late preterm] 37+0- 38+6 [Early term] 39+0- 41+6 [full term]	 9 (69.2%) 72 (69.2%) 23 (22.1%)
2 (n= 39)	32+0- 33+6 [Moderately preterm] 34+0- 36+6 [Late preterm] 37+0- 38+6 [Early term] 39+0- 41+6 [full term]	4 (10.3%) - 10 (25.6%) 25 (64.1%)
3 (n= 7)	32+0- 33+6 [Moderately preterm] 34+0- 36+6 [Late preterm] 37+0- 38+6 [Early term] 39+0- 41+6 [full term]	- 2 (28.7%) 5 (71.4%) -

Figure 7: Column chart showing GA according to nuchal cord



IV. Discussion

In this study, 8.7% were between 18- 20 years, 42.7% were between 21 to 25 years, 36.7% were between 26 and 30 years, 12% were between 31- 35 years with the mean age being 25.7± 1.9 years.

The study findings concurred with a study by Młodawska M et al in which median age of patients was 32 years[4].

The present study findings were similar to a study by Dias Z et al in which 32.5% were in 21 – 25 years of age, 26.9% were ≤20 years of age and 22.4% were 26 – 30 years old[5].

The study findings were similar to a study by Begum AA et al in which majority of the patients (46.71%) were from the age group of 21-25 years[6].

In the present study, 62.7%were primi's and 37.3% were multi- gravidas.

The study findings concurred with a study by Młodawska M et al in which 51% were multiparas[4].

The present study findings were similar to a study by Dias Z et al in which 52.8% were multigravida and 47.2% were primipara[5].

The present study findings were different to a study by Begum AA et al in which 61.2% were multipara and 38.8% were primigravida[6].

In this study, 58% were early term, 32% were full term, 7.3% were late preterm and 2.7% were moderately preterm.

The present study findings concurred with a study by Młodawska M et al in which median gestational age at delivery was 39 weeks.

The present study findings were similar to a study by Dias Z et al in which 69.6% were 38 – 40 weeks of gestational age.

In the present study, the mode of delivery was normal vaginal delivery in 60.7%, caesarean section in 34.7% and in 4.7% it was assisted delivery.

The present study findings concurred with a study by Młodawska M et al in which 32.14% were vaginal deliveries and 52.4% were caesarean section and 1.9% were vacuum assisted deliveries.

The present study findings were similar to a study by Dias Z et al in which 58.4% were normal vaginal deliveries, 29.2% were instrumental deliveries and 12.3% were caesarean sections.

The present study findings were comparable with a study by Singh G et al in which 89.23% had vaginal delivery, 10.76% had caesarean, 0.01% were assisted deliveries[7].

The present study findings were consistent with a study by Gupta J et al in which 85.7% were vaginal deliveries, 8.7% were LSCS and 5.6% were assisted vaginal deliveries[8].

The present study findings concurred with a study by Sonawane PK et al in which 76% patients had normal delivery, 6.66% had instrumental delivery and 17.33% had LSCS[9].

The present study findings were similar to a study by Begum AA et al in which caesarean section rate was lower among nuchal cord pregnancies while instrumental delivery rate was higher in such pregnancies.

The present study findings were in sync with findings of Phadol VA et al in which 68% were vaginal deliveries, 6% were instrumental deliveries and 26% were caesarean deliveries[10].

In this study the ultrasonography of the cord revealed that 69.3% had one loop around the neck, 26% had two loops in 26% and 4.7% had 3 loops.

The present study findings were similar to a study by Dias Z et al in which 83.1% had single loop and 16.9% had multiple loops.

The present study findings were comparable with a study by Singh G et al in which 91% had single loop, 7.4% had two loops and 1.6% had three loops.

The present study findings were consistent with a study by Gupta J et al in which 97.5% showed nuchal cord in ultrasonography.

The present study findings were comparable to a study by Shreshta NS et al in which incidence of nuchal cord at the time of delivery was 22.85%. Incidence of single nuchal cord was highest (18.95%)[11].

The study findings concurred with a study by Sonawane PK et al in which 92% patients had 1 loop of cord, 6.7% patients had 2 loops of cord and 1.3% patient had 3 loops of cord.

The present study findings were similar to a study by Begum AA et al in which 87.5% had single loop and 12.5% had multiple loops.

The present study findings were in sync with findings of Phadol VA et al in which 80% had single loop, 20% had two loops.

The present study findings were comparable to a study by Shereen K et al in which 79.66% had one loop, 15.25% had two loops and 5.08% had three loops.

In this study, the liquor was meconium stained in 23.1% each for one and two loops around the neck respectively.

The present study findings were similar to a study by Kong CW et al in which nuchal cord with three loops were associated significantly with meconium-stained liquor.

The study findings were comparable with a study by Singh G et al in which 6.15% had meconium-stained liquor.

The present study findings were consistent with a study by Gupta J et al in which 11.7% of nuchal cord births had meconium-stained liquor.

The present study findings were comparable to a study by Shreshta NS et al in which meconium-stained liquor was high among nuchal cord group as compared to controls but not statistically significant.

The study findings concurred with a study by Sonawane PK et al in which 9.33% patients had meconium-stained liquor.

In this study, majority (69.2%) of babies in single loop were early term, 64.1% of babies in two loops group were full term and 71.4% in three loops group were early term. There was very less incidence of preterm in all 3 groups.

The present study findings were comparable to a study by Shereen K et al in which number of loops had no statistical association with gestational age of delivery.

V. Conclusion

Based on the findings of this study, it can be concluded that the presence of a nuchal cord, regardless of the number of loops, is a significant factor that necessitates close monitoring and often intensive neonatal care. Although a majority of the babies with nuchal cords required admission to the neonatal intensive care unit (NICU), it is noteworthy that none of the infants developed serious complications. This suggests that with proper monitoring and timely intervention, the presence of a nuchal cord does not necessarily lead to adverse neonatal outcomes. In addition to these findings, it is important to consider that while the presence of a nuchal cord may pose certain challenges during labor and delivery, the outcomes can be favorable with appropriate medical care. Overall, this study contributes valuable insights into the clinical management of pregnancies complicated by nuchal cords. It emphasizes the importance of individualized care and the need for continued research to further understand the implications of nuchal cords on neonatal outcomes. These findings should encourage healthcare providers to remain vigilant but also reassured that with current practices, the risks associated with nuchal cords can be effectively managed, ensuring positive outcomes for both mothers and babies.

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