


# Factors Associated with Nuchal Cord on Singleton Delivery at GESHARTH in Yaoundé: A Case Control Study

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## Abstract

**Introduction:** Nuchal cord is a common finding during delivery. This study aims to evaluate the frequency, predictors and outcomes of nuchal cord in a reference hospital in Yaoundé. **Materials and Methods:** We conducted a retrospective case—control study in the Gynecological Endoscopic Surgery and Human Reproduction Teaching Hospital of Yaoundé between March 2022 and March 2024. The target population was singleton delivery with a longitudinal lie above 37 weeks of gestation. **Results:** Out of 342 deliveries, there was nuchal cord found in 55, thus the frequency was 16.1%. Factors associated with nuchal cord were: non reassuring fetal tones during labor (4.68 [2.1 - 8],  $p = 0.007$ ) and the need for neonatal resuscitation after delivery (3.8 [2.1 - 6],  $p = 0.03$ ). In addition, an APGAR score at the first minute of  $8.1 \pm 0.4$  was found to be associated with the presence of nuchal cord. Variables like: mean gestational age, mean duration of labor, mean fetal weight and mean length of the umbilical cord were higher in the nuchal cord group, therefore no difference was found with the control group. **Conclusion:** The frequency of nuchal cord was 16.1%. Factors associated with nuchal cord included: non reassuring fetal tones during labor, an APGAR score at first minute of 8.1 and the need for neonatal resuscitation after delivery.

## Keywords

Nuchal Cord, Singleton Delivery, Factors, Yaoundé

## 1. Introduction

The umbilical cord carries the essential function of permitting materno-fetal ex-

changes of gazes and nutrients during pregnancy. This function may be interrupted by umbilical cord accidents including cord prolapse, true cord knots, nuchal cords and cord entanglements in monoamniotic twins [1]. Nuchal cord is a common finding at delivery with an incidence ranging from 1.8% and 35.1% [2]-[4].

Risk factors include: increased gestational age, polyhydramnios, multiple pregnancy [3] [5]. Even if controversies still exist, nuchal cord is linked to adverse outcomes such as non-reassuring fetal status, acute fetal distress and increased perinatal mortality [2] [4].

The lack of recent literature prompted our study. The aim was to draw up the frequency and determinants of delivery in case of nuchal cord in a reference hospital of Yaoundé.

## 2. Materials and Methods

We conducted a retrospective case—control study at the Gynecological Endoscopic Surgery and Human Reproduction Teaching Hospital of Yaoundé (GESHRTH) covering the period March 2022-March 2024. The GESHRTH is a public hospital addressing the infertility issue in the city of Yaoundé and an IVF reference center. The target population was all patients who delivered a singleton pregnancy with a longitudinal lie above 37 weeks of gestation. Patients were divided into two groups. Patients with nuchal cord reported at the time of delivery were cases, while patients without nuchal cord were controls. Nuchal cords, be it single, multiple, tight or loose were considered. Recruitment was consecutive. We recruited the next two eligible deliveries occurring without a nuchal cord for each case of nuchal cord identified. No matching was done.

For the purpose of the study, non-reassuring fetal status was defined as persistent bradycardia, persistent tachycardia, variability less than 5/minute, or the occurrence of variable deceleration on cardiotocography. The duration of labor referred to the duration of the active phase of labor until delivery, measured from the time the patient was admitted into the latent phase, or estimated when the patient was already in the active phase of labor.

Patients, both cases and controls were identified from the logs of the delivery room. Then, files were retrieved and data collected from the files.

Data analysis was performed using R software version 4.3.2. Khi square and Fisher tests were used to compare proportions. Wilcoxon and Mann-Whitney tests were used to compare means. The significance threshold was set at  $p \leq 0.05$ .

## 3. Results

During the period of study, 342 singleton deliveries were recorded. Out of them, the presence of nuchal cord at the time of delivery was reported in 55 cases, thus the frequency of nuchal cord was 16.1%. We retained 110 controls.

The mean age was  $30.5 \pm 0.9$  ( $31 \pm 1.6$  in the control group,  $p = 0.7$ ). The mean parity  $2.7 \pm 1.1$  ( $3.2 \pm 1.9$  in the control group,  $p = 0.22$ ). The mean gestational age at the moment of delivery was  $39.9 \pm 0.8$  weeks ( $39.2 \pm 1.2$  in the control

group,  $p = 0.9$ ). The mean fetal weight was  $3358 \pm 0.462$  g ( $3280 \pm 0.345$  in the control group,  $p = 0.59$ ).

As shown in **Table 1**, only gestational age above 40 weeks was found to be a predictor of nuchal cord (OR = 1.32 [1.02 - 2.3],  $p = 0.001$ ). As a result of the presence of nuchal cord, outcomes included: non reassuring fetal heart rate during the labor (OR = 4.68 [2.1 - 8],  $p = 0.007$ ), first minute APGAR score lower than 7 (OR = 3.76 [1.9 - 6.5],  $p = 0.01$ ) and the need for neonatal resuscitation after delivery (OR = 3.8 [2.1 - 6],  $p = 0.03$ ).

**Table 1.** Factors associated with nuchal cord.

Variables	Cases (N = 55) n (%)	Controls (N = 110) n (%)	Unadjusted OR [CI 95%]	p-value
<b>Type of conception</b>				
Spontaneous	55 (100)	106 (96.3)	/	0.6
IVF	0 (0)	4 (3.7)	/	0.5
<b>Fetal heart tones</b>				
Normal	40 (72.7)	102 (92.7)	0.21 [0.05 - 0.6]	0.08
Non reassuring	15 (27.3)	8 (7.3)	4.78 [2.1 - 8]	<b>0.007</b>
<b>Amniotic fluid</b>				
Normal	34 (61.8)	86 (78)	0.45 [0.2 - 0.9]	<b>0.03</b>
Meconium stained	21 (38.2)	24 (22)	2.21 [1.2 - 5.1]	0.08
<b>Presentation</b>				
Cephalic	55 (100)	108 (98)	/	0.4
Breech	0 (0)	2 (2)	/	0.5
<b>Mode of delivery</b>				
Elective cesarean	0 (0)	4 (3.6)	/	0.1
Emergency cesarean	10 (18.2)	11 (10)	/	0.1
Vaginal delivery	45 (81.8)	95 (86.4)	/	0.5
<b>Sex</b>				
Male	18 (32.7)	42 (38.2)	0.78 [0.4 - 1.8]	0.9
Female	37 (67.3)	68 (61.8)	1.27 [0.9 - 2]	0.6
<b>Neonatal resuscitation</b>				
No	44 (80)	103 (93.6)	0.27 [0.1 - 1.2]	0.06
Yes	11 (20)	7 (6.4)	3.6 [2.1 - 6]	<b>0.03</b>
<b>Gestational age (weeks)</b>				
37 - 40	18 (32.7)	43 (39.1)	0.76 [0.4 - 0.9]	0.06
>40	37 (67.3)	67 (60.9)	1.32 [1.02 - 2.3]	<b>0.001</b>

## Continued

Duration of labor (hours)				
<6	24 (43.6)	76 (69.1)	0.35 [0.13 - 1.1]	0.06
≥6	31 (56.4)	34 (30.9)	2.89 [1.3 - 5.7]	0.59
Fetal weight (g)				
<2500 g	11 (20)	32 (29.1)	0.61 [0.35 - 1.1]	0.64
2500 - 3500 g	26 (47.3)	45 (40.9)	1.29 [0.89 - 2.8]	0.8
>3500 g	18 (32.7)	33 (30)	1.13 [0.7 - 2.1]	0.4
First minute APGAR score				
<7	38 (69.1)	41 (37.3)	3.76 [1.9 - 6.5]	<b>0.01</b>
≥7	17 (30.1)	69 (62.7)	0.26 [0.09 - 0.7]	0.07
Length of umbilical cord (cm)				
<60	15 (27.3)	34 (30.9)	0.84 [0.5 - 1.3]	0.16
60 - 80	18 (32.7)	45 (40.9)	0.7 [0.46 - 0.96]	0.07
>80	22 (40)	31 (28.2)	1.69 [1.2 - 3.6]	0.09

Normal amniotic fluid was found to be a protective factor (OR = 0.45 [0.2 - 0.9],  $p = 0.03$ ).

After multivariate analysis (**Table 2**), gestational age above 40 weeks, non-reassuring fetal heart rate and first minute APGAR score were found to be associated with nuchal cord.

**Table 2.** Multivariate analysis of associated factors with nuchal cord.

Variables		Cases (%) N = 55	Adjusted OR [CI 95%]	p-value
Gestational age	>40 weeks	37 (67.3)	2.5 [1.99 - 5.12]	<b>0.001</b>
Non reassuring fetal heart rate	Yes	15 (27.3)	2.9 [1.4 - 6.9]	<b>0.003</b>
Amniotic fluid	Normal	34 (61.8)	0.32 [0.02 - 1.6]	0.04
First minute APGAR score	<7	38 (69.1)	4.2 [2.02 - 8.3]	<b>0.0001</b>
Neonatal resuscitation	Yes	11 (20)	1.2 [0.82 - 3.3]	0.0001

#### 4. Discussion

The frequency of nuchal cord at birth in our study was 16.1%. Vasa *et al.* reported a frequency of 23.5% [5]. However, they noted the presence of a tight nuchal cord in 1.9% of patients. Our result is similar to those of Kemfang and Fouelifack, who reported frequencies of 16.2% and 15.15%, in Yaoundé, Cameroon [6] [7]. Mbodji *et al.* in Senegal noted a significantly lower frequency of 1.8% [2]. The frequency we found falls within the normal range.

We noted a mean parity of 2.7 in patients with a nuchal cord, while it was 3.2 in the control group. This difference, however, was not statistically significant. This result is consistent with that of Vasa *et al.*, who noted that 73.6% of patients were multiparous [5]. Fouelifack *et al.* noted that 69.1% of patients were multiparous. We also reported a gestational age of 39.9 weeks and 39.2 weeks, respectively, for cases and controls groups. Moreover, gestational age above 40 weeks was a predictor of the occurrence of nuchal cord in our study. Vasa *et al.* observed an increased risk of nuchal cord with gestational age, from 15.6% before 36 weeks to 22.8% after 37 weeks. Mbodji *et al.* observed that post-term deliveries were more frequent in cases of nuchal cord (8% versus 4.3% in the absence of nuchal cord).

In our series, we demonstrated an association between the Apgar score at the first minute and fetal heart rate abnormalities and the presence of a nuchal cord. Mbodji *et al.*, regarding fetal prognosis, noted that the presence of a nuchal cord doubled the risk of heart rate abnormalities, the risk of cesarean section, a low Apgar score at 5 minutes, and the risk of neonatal resuscitation [2]. Kemfang *et al.* observed that an Apgar score below 7 was more frequent in the group with tight nuchal cords compared to the group with loose nuchal cords [6]. In a series on risk factors for neonatal asphyxia in the context of umbilical cord entanglement, Foumane *et al.* noted that maternal age under 20 years, first delivery, lack of prenatal ultrasound during the pregnancy, the presence of multiple cord loops, and a second stage of labor lasting more than 30 minutes during vaginal delivery constituted risk factors for asphyxia [4]. Fouelifack *et al.* noted that male sex and an umbilical cord length greater or equal to 70 cm constituted risk factors for cord entanglement [7]. Silva *et al.* found that nuchal cord was associated with lower Apgar score at the first minute and higher arterial cord blood pH [8].

Awowole *et al.* found that the umbilical cord was 12 cm longer among newborns with a nuchal cord than among newborns without. In addition, he reported that contextual factors such as delivery setting, availability of continuous electronic monitoring during labor, emergency preparedness for intervention for fetal heart rate abnormalities, the decision to delivery interval during obstetric emergencies and the capacity for neonatal resuscitation may contribute to interfere with perinatal outcomes [1].

Ogueh *et al.* found that when compared to pregnant women without a nuchal cord, the presence of a nuchal cord is associated with a greater proportion of induction of labor, augmentation of labor and a longer second stage of labor [9]. A tight nuchal cord was linked with shoulder dystocia too.

## 5. Limitations

Since the study was retrospective, there was a lot of missing data. Variables, like antenatal diagnosis of nuchal cord through ultrasound in the delivery room, the number of nuchal cord loops, and even the presence of tight or loose nuchal cord were not evaluated. Besides, due to the nature of the study, an association does not mean causality.

## 6. Conclusion

The frequency of nuchal cord was 16.1% during the period of study. Factors associated with nuchal cord included: non reassuring fetal tones during labor, an APGAR score at first minute of 8.1 and the need for neonatal resuscitation after delivery.

## Conflicts of Interest

The authors declare no conflicts of interest.

## Author's Contributions

Serge Robert Nyada drafted the first version. Pascale Mpono Emenguele, Vanina Ngonon Akam, Anny Ngassam, Junie Metogo Ntsama, Jeannette Ngoué Epée, Sandrine Mendibi read and approved the final version. Etienne Belinga and Claude Noa Ndoua supervised the research.

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