Original Research Article

The effect of nuchal cord on mode of delivery and neonatal outcome in a semi-urban area of western Maharashtra

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Abstract

Background: Nuchal cord is an umbilical cord that passes 360 degrees around the neck. It is found to be the leading cause of fetal distress and perinatal complications. Single and multiple loops of cord have different types of impact on mode of delivery and neonatal outcome. Nuchal cord causing indentation on fetal skin is considered as tight nuchal cord. which can influence on neonatal outcomes. **Objectives:** This study aimed to evaluate the effect of nuchal cord on mode of delivery and neonatal outcome **Materials and Methods**: This pilot study was a prospective, observational, comparative study conducted on women having 19 to 30 years of age with 35-40 weeks of gestation. Total sample size was 100 having equal number (50) of cases with and controls without nuchal cord. All these antenatal cases were reported on obstetric ultrasound in a diagnostic centre at semi-urban area in western Maharashtra. The mode of delivery and perinatal outcomes were obtained from hospital records. The results were compared with control groups regarding mode of delivery, presence of nuchal cord, number of loops, type (tight or loose) of cord, APGAR score and admission of newborn to neonatal care unit. **Results:** Statistically significant difference was seen in relation to the condition of cord and mode of delivery. (P-value 0.014). Statistically significant difference was not seen with respect to mode of delivery, APGAR score at 1 min and neonatal outcome in cases with single loop of nuchal cord. **Conclusion:** Tight nuchal cord may increase the chances of cesarean section and instrumental deliveries. Number of loops of nuchal cord does not affect mode of delivery or further neonatal outcomes. Further multicentric studies with larger data are recommended.

Key Word: Cesarean section, Doppler, Fetal distress, Nuchal Cord, Perinatal Outcome, Pregnancy Outcome, Ultrasonographic,

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INTRODUCTION

Nuchal cord is considered as a major cause for birth related asphyxia and other neonatal complications. Nuchal cord is held responsible for foetal distress and perinatal mortality[3]. Hippocrates described nuchal cord as one of the great dangers during eight months of pregnancy. He described how persistent nuchal cord until term can lead to foetal distress. Nuchal cord by definition is 360 degrees around the fetal neck described by Crawford S in 1962.[1] Its occurrence is reported 6-37 % during deliveries. Incidence of single loop is comparatively more (20.6 %) than double loop (2.5 %) and triple loop (0.2%) as reported by Shui and Eastman[2]. Nuchal cord is usually detected by ultrasound examination conducted before delivery as described by Jouppila and Kirkinen in 1982.[4] It can be suspected by cardiotocograph and particularly if there is 'shouldering' or if they are of a 'double variable' or 'W pattern'[5]. Manual compression of fetal neck abdominally may cause fetal heart rate changes in cases of nuchal cord, but it is a indirect method of detection. Acoustic vibratory stimulation can result in similar changes. If foetal heart rate goes below 100 beats/min and does not return to normal, (120-160 beats/min)

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nuchal cordcan be suspected[6]. Its direct impact on adverse fetal or neonatal outcome is quiet controversial and usually debated. Tight nuchal cord can cause fetal asphyxia and death. But this fact is not well proven. The presence of a nuchal cord has been found to be associated with many different factors in the mother, fetus, cord, placenta and labor and with a less favorable fetal outcomes; however, the majority of these studies are case reports or small series. This research work will further elaborate prenatal diagnosis of nuchal cords and its impact on perinatal outcome and mode of deliveries. The impact of a nuchal cord on induction of labor is unknown and there are no studies that have specifically studied this group of women. In a recent retrospective case control study Rhoades *et al*[7] found that a nuchal cord was actually an independent risk factor for induction of labor. Recently the color Doppler imaging has been implemented as an aid to sonographic diagnosis[8]. Generally the sensitivity of diagnosis is higher with color Doppler imaging and it may have a particular advantage in the presence of ruptured membranes. Three-dimensional ultrasound has also been used, but it appears to have little advantage over color Doppler imaging[9].According to study conducted by Morarji *et al.*, tight nuchal cord is responsible for hypovolumic shock and anemia due to partial compression of cord[10].The opinions about tight nuchal cord at birth delivery vary from normal findings to cause of lethal problem[11]. In this study we tried to classify nuchal cord according to number – single or multiple and according to its relative positions with respect to neck loose or tight. We tried to demonstrate divot sign, indentation on the nuchal skin in sagittal view. Larson JD *et al*[12] reported that the overall incidence of nuchal cords was 6% at 20 weeks GA and 29% at 42 weeks of gestation. Henry, *et al*[13] observed incidence of tight nuchal cord around by 6.6% and 21.6% loose nuchal cord. In his retrospective study Miser *et al*[14] demonstrated no influence of maternal age, race, parity on the incidence of nuchal cords. Nuchal cord is found in 20% of normal deliveries.

MATERIALS AND METHODS

This was a prospective, cross-sectional, comparative pilot study conducted from February 2017 to March 2017.Total 100 women were enrolled with 35-40 weeks of gestation age. Written informed consent was obtained from all women. All sonographic examinations were done by single sonologist to reduce the personal variation. The groups were comparable in terms of selections of antenatal cases like socioeconomic status, age and without any other obstetrical complications like Pregnancy induced hypertension, diabetes, bleeding etc. All pregnant women were of 19 to 30 years of age. The study included fifty antenatal cases having nuchal cord on obstetric ultrasound in a diagnostic centre at semi urban area in maternity Hospital at western Maharashtra. Other 50 antenatal cases were selected without any nuchal cord at the same centre. Acuson 150 (Siemens) ultrasound machine was used with a 3.5 MHz abdominal probe and trans-abdominal sonography was done with gray scale and Colour Doppler study prior to labor. All examinations were done by single sonologist. The outcomes of delivery and perinatal condition of baby was obtained from the record of mothers and neonates. All these deliveries was conducted by a single obstetrician and at the same centre to avoid personal variation. Mode of delivery, presence of nuchal cord, number and condition of loops (tight or loose), APGAR score and admission to neonatal unit were noted. Statistical analysis was done by using chi-square test.

OBSERVATIONS AND RESULTS

In this pilot study, total 100 cases were enrolled (Diagram 1). Out of these 50 % (50) were without nuchal cord (control) and 50% (50) cases with nuchal cord. In the group with nuchal cord, 68% (34) patients had normal delivery, 26 % (13) had caesarean section and 6%[3] had instrumental (ventouse) deliveries. In control group, 74% (37) had normal delivery, 22 % (11) had caesarean section and 4% [2] had instrumental (ventouse) delivery.

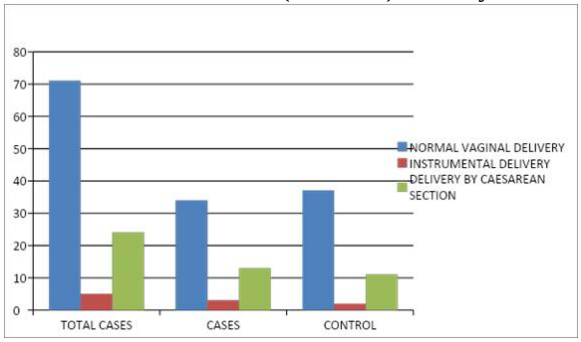

Figure 1: Mode of Delivery (Pregnancy outcome)

Considering the condition of new-borns at birth in the group with nuchal cord,92% (42) had more than seven and 8 % (4) had less than seven APGAR score at one minute after birth. In control group, 96 % (48) had more than seven and 4%(2) had less than seven APGAR score (Table1).

Table1: APGAR Score at 1 min in case and control group.

	Score < 7	Score > 7	Total
Cases	4(8%)	46 (92%)	50
Controls	2 (4%)	48 (96%)	50
Total			100

Total 66% (33) patients had single loop, 8 % (9) had two loops and 16 %(8) had three loops of cord around neck on antenatal ultra sonography (Diagram 2).

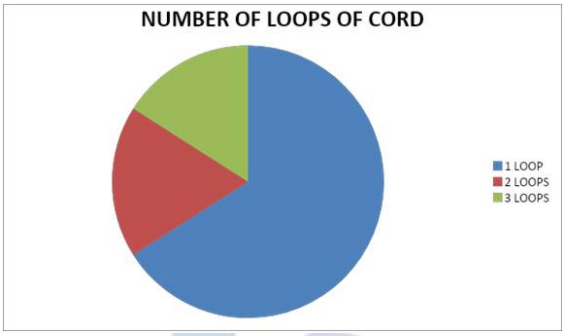

Figure 2: Number of loops of cord in the study

The condition of loops of cord (tight or loose) and mode of delivery was also observed in this study (Table 2) Loose cord was seen in 66% (33) and tight cord in 34% (17) cases. Patients with tight loops of cord underwent caesarean sections in 47 % (8) cases, normal deliveries in 17% (7) followed by instrumental deliveries in 11% (2). While patients with loose loop of cord, 81% (27) underwent normal deliveries, 15% (5) by Caesarean section and 3% (1) by instrumental delivery

Table 2: Condition of Cord (Tight or loose) and mode of delivery

Cord	Normal Delivery	Instrumental (Ventouse) Delivery	Caesarean Section	Total
Tight	7 (17%)	2 (11%)	8 (47%)	17
Loose	27 (81%)	1 (3 %)	5 (15%)	33

Patients with single loop of cord underwent 82% (27) normal vaginal deliveries, five caesarean sections and one instrumental delivery. Patients with two loops of cord underwent 67% (6) normal vaginal deliveries,22%(2) caesarean sections and one had instrumental delivery. Patients having three loops of cord had 50 % (4) caesarean section and 50 % (4) had normal vaginal deliveries (Table 3).

Table 3: Number of loops and Mode of delivery

No. of loops	Normal l Delivery	Instrumental (Ventouse Delivery)	Caesarean Section	Total
1 loops	27 (82 %)	1 (3 %)	5 (15%)	33
2 loops	06 (67 %)	1 (11%)	2 (22%)	9
3 loops	04 (50 %)	0 (0%)	4 (50 %)	8

The rate of admissions to NICU was 16% (8) in the group with nuchal cord and 10 %(5) in control group (Diagram 3).

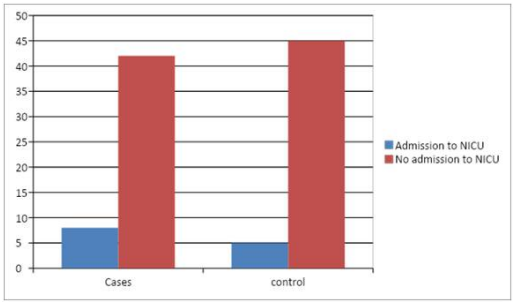

Figure 3: Admission Rate to NICU in the Study

Table 4: Number of loops and Admission Rate to NICU

	Total cases	Admission to NICU
1 loop	33	2 (6 %)
2 loops	9	2 (22 %)
3 loops	8	4 (50 %)

Considering the rate of admissions to NICU and number of loops, total 66%(33) had single loop, 8 % (9) with two loops and 16 %(8) had three loops detected on antenatal ultrasonography. Out of them, 6% (2) newborns with single loop, 22% (2) with two loops and 50% with three loops had NICU admissions (Table 4). Though admission rate in nuchal cord group was more than non-nuchal cord group, but statistical difference was not seen. Increase in rate of caesarean section and instrumental delivery was noted in cases with tight cord around the neck and it was statistically significant (P value 0.014) in this study. But, there was no statistical significant difference (P value 0.400) in the APGAR score at 1 min in both the groups with and without nuchal cord. The effect of tight cord on mode of delivery was not statistically significant (P value 0.195) correlation.

DISCUSSION

In this study, it was noted that there is no any increased risk of complications during labour or neonatal complications as compared to controls. The observations are almost nearly similar in both cases with and without nuchal cord. Nuchal cord does not appear to increase the risk of adverse maternal or neonatal outcomes in low-risk women population. Divot sign was demonstrated, which is indentation on the nuchal skin in sagittal view but noadverse obstetrical or neonatal outcome was seen in cases with single loop of nuchal cord. The incidence of cesarean section was found to be similar in both the cases with and without nuchal cord[15]. No any still birth was reported in this entire study. But previous studies had mentioned that nuchal cord may be considered as a cause for unexplained fetal deaths[16]. Nuchal cord with single loop or loose cord is commonly detected with good outcome. According to the research study conducted by Collins and team, there is poor outcome with locked nuchal cords[17] but it is difficult to differentiate sonographically between locked and unlocked cords. Multiple cord loops may be less likely to undergo uncoiling before labor, easier to visualize on ultrasound than single cord loops and it may affect mode of delivery and neonatal outcomes. Nuchal cords are not associated with adverse perinatal outcome[18]. Sheinwe *et al*. studied outcomes of 182492 births and reported less morbidity and less mortality associated with a nuchal cord. Judy SlomeCohain described Nuchal cords are necklaces and not nooses. Research based on 182,492 births, wielding statistical power to uncover even mild negative co-relation, demonstrated that both single and multiple nuchal cords at the time of delivery are not associated with adverse perinatal outcomes. Nuchal cords are associated with higher birth weights and lower cesarean section rates than births without nuchal cords[19]. Although there are varied opinion about tight nuchal cords as no clinically significant outcome is associated with it in one study[20]. Peesay M in his review tried to explain that nuchal cords are a potential cause for perinatal distress and a rarely significant risk factor for long-term neurodevelopmental consequences in the developing fetus[21]. It's difficult to diagnose tight nuchal cord sonographically. MCA and UA resistance index ratio are needed to predict fetal hypoxia in fetuses with nuchal cord[22].In our study 16% of babies with nuchal cord required admission to NICU as contrast to 3.2% of babies with nuchal cord needed NICU admission in a study conducted by Vasa R[23]. This observation is comparable to percentage in controls. Nuchal cords do not influence primary neonatal management[24]. Hence detection of nuchal cord by sonography is normal event[24].It need additional investigations like blood sampling of umbilical artery after birth of babies to know reduced oxygen level[24]. In our study women with multiple loops of nuchal cord delivered with emergency Cesarean section and their babies needed NICU admissions, which correlate to observations by Henoch *et al*[2]. Among 3,809 cases with nuchal cord with 1 loop at delivery, 1,035 (2.42%) had 2 loops and 258 (0.6 %) had 3 loops. While the presence of nuchal cord with 1 loop was not found to be associated with adverse outcomes. But nuchal cord with 3 loops was associated with increased risk of intrauterine fetal death and increased rates of Apgar score <7 at 1 and 5 minutes and with increased prevalence of instrumental vaginal delivery. Moreover, Mariya and team in 2018 also reported that the nuchal cord with 2 or 3 loops was found to be associated with higher incidence of intrauterine growth restriction[25]. Joshi *et al* were also of same opinion that tightness of loop or multiple loops adversely affect perinatal outcomes like intra-partum FHR deceleration, low Apgar score at 1 min and increased probability of operative delivery[26]. Further studies are needed for reliable diagnosis of tight nuchal cord to predict its consequences. One must demonstrate locked cords as described by Collins *et al*[27]. Locked cords are definitely associated with poor outcomes. Wang *et al.* emphasized increased risk with multiple loops than a single or double loop[28] Some studies have reported that a nuchal cord may increase the risk of an APGAR score of less than 7 at 1 minute[29]. In this study,

there was no any significant statistical difference with low Apgar score at 1 minute in neonates with and without nuchal cord.

CONCLUSION

Condition of cord significantly affects the mode of delivery. Nuchal cord may affect the condition of newborn at birth. Type of cord can affect on mode of delivery. Nuchal cord with single loop has no role in the obstetric management and it does not affect neonatal outcome. It is difficult to predict about the complications due to nuchal cord before labor. Mentioning about nuchal cord in the obstetric USG report may cause undue anxiety in patients and obstetricians but it helps in obstetrical management[27]. There are many limitations in the proper diagnosis of tight nuchal cord. Further multicentric studies with large data to detect tight nuchal cord and its effects on mode of delivery and neonatal outcomes are required. Stillborns with tight nuchal cord (tCANs) need further evaluation by pathologists like fundoscopy for retinal hemorrhages, otoscopy to see any hemotympanum and X-ray of hyoid bone for fractures[10]. This may further help to prove lethal aspects of tCANs. Nuchal cord with 3 loops was found to be associated with higher incidence of intrauterine fetal death, intrauterine growth restriction, increased operative deliveries and lower Apgar scores[2]. It is quiet difficult to differentiate between tight cord and loose cord on antenatal sonography. Further research studies are needed focusing on diagnosis and other aspects of tight nuchal cord.

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