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Research Article

Maternal and neonatal outcome in newborns with nuchal cord loop: a comparative study

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ABSTRACT

Background: To compare the maternal and neonatal outcome between the new-born with and without nuchal cord loop at the time of delivery.
Methods: It is a prospective comparative study, conducted in Mahatma Gandhi Medical College and Research Institute, Pondicherry from August 2013 to May 2014. All the pregnant women, who fulfill the inclusion and exclusion criteria, were taken into account and allowed to have the normal course of labour. At the time of delivery all neonates born with nuchal cord loop were taken as the study group and without nuchal cord loop were included in the control group. Cord blood gas analysis was done using blood gas analyzer (Radiometer ABL5) for neonates with Apgar score <7 at 1 minutes. Outcomes measured were requirement of induction of labour, requirement of augmentation with oxytocin following spontaneous onset of labour, duration of labour, mode of delivery , amniotic fluid index, foetal heart rate irregularities, birth weight, meconium stained liquor, Apgar score, cord blood gas analysis like pH, PO_2, PCO_2 (neonatal parameters) in new-born with nuchal cord loop.
Results: There were no statistically significant differences between the two groups in relation to maternal outcome .As far as neonatal outcome concerned, although meconium stained liquor (15.3% vs. 10.6%), foetal heart irregularities (20.9% vs. 11.5 %) and 1st minutes Apgar score <7 (13.2% vs. 7.2%, p=0.033) are more in the study group , the difference is not significant.
Conclusions: The study concluded that the presence of nuchal cord loop does not adversely affect the maternal outcome. Although it increases the meconium stained liquor, affect FHR irregularities and low 1st minute Apgar score, it does not increase the operative interference in mother.

Keywords: Nuchal cord loop, Maternal neonatal, Outcome

INTRODUCTION

When the umbilical cord is wound around the foetal neck then the condition is called nuchal cord loop. Until 20 weeks of gestation the incidence of nuchal cord loop is rare as the umbilical cord is shorter than the foetal body and so the chances to wrap around the neck or head is less.[1] With the increase in the gestational age the persistence of the nuchal cord loop is more. Foetal asphyxia, deflexion attitudes and malpresentations are stated as some of the sequel of foetuses complicated with nuchal cord loop. Multiple nuchal cord loop increases the development of intra-partum complications and lower Apgar scores.[2] The current assumption is that the compression of the umbilical cord during labour and delivery decreases the umbilical blood flow causing hypoxemia, hypercapnia, and acidosis in the foetus.[3] It is reported that nuchal loops are associated with increased induction of labour, slow progress of labour, and shoulder dystocia.[4] During labour, variable foetal heart decelerations with contractions on the foetal monitor

suggest the presence of nuchal cord loop. In a study by Larson JD et al there was evidence that shows that the new-borns with nuchal cord loops are prone to increased risk of adverse neonatal outcome.[5] Ultrasound machines are being used to detect nuchal cord loops and if found patients are being taken for lower segment caesarean section (LSCS) straight away. So presence of nuchal cord loop has indirectly increased the rate of elective caesarean sections. The question that needs to be solved is whether detecting the nuchal cord loop at admission for delivery has to be followed expectantly or active planning of delivery at term pregnancies is needed.

Considering the above mentioned facts the present study was taken up to find out the maternal and the neonatal outcome that occurs in babies born with nuchal cord loop.

METHODS

This was a prospective comparative study, which was conducted at the Mahatma Gandhi Medical College and Research Institute Hospital after obtaining due Institutional Human Ethical Committee clearance. All the new-borns from August 2013 to May 2014, fulfilling the inclusion criteria (Singleton pregnancy Gestational age >37 completed week, Cephalic presentation) and exclusion criteria (Neonates born to mother with medical disorder or with congenital malformation, multiple gestation) were considered for study.

All the pregnant women were allowed to have the normal course of labour. At the time of delivery all neonates born with nuchal cord loop were taken as the study group (n=235). Similarly parity and gestational age matched neonate who fulfilled inclusion criteria but without nuchal cord loop were included in the control group (n=235).

Parameters assessed were requirement of induction of labour, requirement of augmentation with oxytocin following spontaneous onset of labour, duration of active phase of labour, mode of delivery, amniotic fluid index, foetal heart rate irregularities, birth weight, number of nuchal cord loops, meconium stained liquor, Apgar score at 1 & 5 minutes, course in NICU. Cord blood gas analysis was done using blood gas analyser (Radiometer ABL5) for neonates with 1 minute Apgar score < 7 immediately. All data was entered into a data collection proforma sheet and were entered into MS Excel 2011. The Statistical software used was namely SAS 9.2, SPSS 15.0, Microsoft word and Excel have been used to generate graphs, tables etc.

RESULTS

During the study period total number of deliveries was 1749, of them 363 term babies were having nuchal cord loop. So the incidence of nuchal cord loop in our study was 20.7%.

Of them 235 were considered as they fulfilled the criteria. The study and control group were maternal age and parity matched (Table1).

Table 1: Patient profile.

	Study group		Control Group		P value
Age					
Mean age(years)	24.71±3.49		24.86±3.61		0.650
Parity					
Primigravida	138	58.7	134	57.0	0.418
Multigravida	97	41.3	101	43.0	

P< 0.05 is significant

In study group 115 women (48.9%) required induction of labour as compared to 103 (43.8%) in the control group. There was no statistically significant difference between the requirement of induction between study and control group (Table 2).

The requirement of augmentation was 38.3% (study) and 34.1% (control) in primigravida as compared to 15.7% (study) and 15.3% (control) in case of multigravida. There was no significant difference in requirement of augmentation between the study & control group (Table 2).

As compared to control group the proportion of vaginal delivery (65.1%) and the operative vaginal delivery (3.4%) is significantly higher in study group. This resulted in reduced proportion of LSCS (31.5%) in study group as compared to control group (40.9%). The difference in reduction of LSCS in study group was statistically significant as compared to control group with *P=0.047* (Table 2).

The mean duration of active phase in case of primiparous in study & control group was 220.34 ± 126.56 and 221.37±89.13 minutes respectively with *P=0.943*. Whereas in case of multiparous women it was 139.40±60.16 and 135.02±72.59 minutes respectively with *P=0.704*. This implied that there was no difference in duration of active phase of labour in both groups (Table 2).

Mean amniotic fluid indices of the control and study group were 82.63 ± 26.67 mm and 78.93 ± 21.88 mm respectively. The difference of mean AFI between control and study group was not significant statistically with *P=0.105* (Table 2).

Meconium staining of liquor was present in 15.3% of the cases with nuchal cord loop when compared to 10.6% of the cases without nuchal cord loop.

Table 2: Maternal Outcome.

	Study group		Control Group		P value
	No	%	No	%	
Requirement of Induction					
Primigravida	83	35.3	78	33.2	0.627
Multigravida	32	13.6	25	10.6	0.323
Requirement of Augmentation					
Primigravida	90	38.3	80	34.1	0.337
Multigravida	37	15.7	36	15.3	0.899
Mode of delivery					
Vaginal	153	65.1	136	57.9	0.107
Instrumental	8	3.4	3	1.3	0.102
LSCS	74	31.5	96	40.9	0.047*
Duration of Active Phase (minutes)					
Primigravida	220.34±126.56		221.37±89.13		0.943
Multigravida	139.40±60.16		135.02±72.59		0.704
Amniotic Fluid Index (mm)					
	82.63±26.67		78.93±21.88		0.105

P < 0.05 is significant

Table 3: Neonatal outcome.

	Study group		Control Group		P value
	No	%	No	%	
Meconium stained liquor					
	36	15.3	25	10.6	0.131
Foetal heart rate irregularity					
	49	20.9	27	11.5	0.005*
Birth weight(in gram)					
Mean ± SD	2869.28 ± 469.47		2830.51 ± 588.62		0.823
Apgar score					
1 Minute (<7)	31	13.2	17	7.2	0.033*
5 minutes (<7)	10	4.3	9	3.8	0.815

P < 0.05 is significant

Table 4: Arterial Blood Gas Analysis.

	Study group (n=31)		Control Group (n=17)		P value
	No	%	No	%	
Potential of hydrogen(pH)					
<7	4	12.9	2	11.8	1.000
>7	27	87.1	15	88.2	
Partial pressure of oxygen (PO_2)					
<80	9	29.1	10	58.8	0.77
80-100	22	70.9	7	41.2	
Partial pressure of carbon dioxide (PCO_2)					
<35	6	19.4	3	17.6	0.891
35-45	9	29.1	6	35.4	
>45	16	51.6	8	47	

The difference was not significant with P=0.131 (Table 3) Foetal heart rate irregularities were seen in 20.9% of newborns in the study group but in the control group only 11.5% of the newborns had foetal heart rate irregularities. This difference of foetal heart rate irregularities were statistically significant with P=0.005 (Table 3).

The mean birth weight in the study and control group was 2869.28±469.47 g and 2830.51±588.62 g respectively. The difference mean birth weight was statistically not significant between both the groups with P=0.823 (Table 3).

Apgar score was <7 at 1 minute in 31(13.2%) babies of study group as compared to 17 (7.2%) babies of control group. This difference was statistically significant with P=0.033. Difference of Apgar score at 5 minutes was not significant.

Data from the blood gas analysis from umbilical vessel showed there was no significance related to potential of hydrogen (pH), partial pressure of oxygen (PO_2) and carbon dioxide (PCO_2) when compared between the study and control group (Table 4).

DISCUSSION

In the present study there was no difference between mean maternal age of study group and control group. Similarly there was no significant difference of maternal age between study and control group according to Onderoglu et al., Zahoor et al., Gupta Y et al.[2,6,7] i.e. 24.75 ± 3.46 vs. 24.56 ± 3.56. But in study by Ogueh O et al. the mean maternal age (29.02 years Vs. 28.86 years) was higher in the pregnancies complicated with nuchal cord loop.[4] This difference may be due to trend of early marriage in our setup.

The incidence of nuchal cord loop was more in primigravida in comparison to multigravida in our study. Similarly, Tamrakar et al. quoted that the incidence of nuchal cord loop in the case of primigravida was higher (62.98%).[8] On the other hand Onderoglu et al. reported that the rate of nuchal cord loop incidence was higher in multiparous (34.9%) when compared to nulliparous women (65.1%).[2] But no obvious reason stated for this.

Our study revealed that there is no difference in the requirement of induction between study group and control group. This difference was also similar among the primigravida and multigravida of study and control group. In a study by Ghi et al., the presence of nuchal cord loop neither prevented the spontaneous onset of labour nor increased the risk of induction failure.[9] Rhodes et al. observed that the requirement of induction of labour was higher in the newborns with nuchal cord loop.[10] Although probable explanation is that nuchal cord loop prevent inefficient contact of presenting part with that of lower uterine segment, this was not evident in our study.

In our study, there was no statistical difference between the study and control group for requirement of augmentation of labour. But Ogueh et al., stated that need for augmentation was higher in newborns complicated with nuchal cord loop (adjusted OR 1.06), probably for the same reason as mentioned for requirement of induction.[4] This is also not evident in our study.

As the duration of active phase of labour differ in primigravida and multigravida we compare it separately in study group and control group. We observed no significant difference in duration of active phase of labour in primigravida of study and control group. Similarly no significant difference in duration of active phase of labour in multigravida of study and control group. No other study mentioned this type of subgroup analysis. According to Ogueh et al. the overall mean duration of labour (9.6 [SD=5.9] h vs. 9.6 [SD=6.1] hours, p=0.890) and the mean duration of first stage of labour (8.9 hours Vs. 9.0 hours) was similar between both the groups.[4] But the second stage of labour was prolonged in the presence of nuchal cord loop and it was much more significant when the nuchal cord loop was tight (56.1 min Vs. 51.7 min). Ghi et al. reported that the incidence of vaginal delivery within 24 hours from the time of induction (53% vs. 59%) and the induction to delivery time (20.6 ± 17.05 hours vs. 21.2 ± 17.5 hours) between the two groups were comparable.[9] However the increased use of oxytocin might have resulted in the decreased duration of labour. In present study the rate of LSCS (31.5%) in study group is comparatively less when compared to control group (40.9%), whereas the operative vaginal delivery (3.4%) is significantly higher in newborns complicated with nuchal cord loop. Similarly Cohain et al., and Assimakopoulos also reported that the nuchal cord loops are associated with low caesarean section rates.[11-13] But the rate of instrumental delivery was high in newborns. This may be explained by increased foetal heart irregularity in second stage of labour in newborns delivered with nuchal cord loop, which is considered to be a sign of foetal distress. However Gurunesh et al. and Zahoor et al. demonstrated that the nuchal cord loop is not associated with increased incidence of operative vaginal delivery or caesarean section.[14,15]

In our study the difference of mean amniotic fluid index in the study group and control group was not significant. Similar results were been reported by Onderoglu LS et al. (11.2% Vs 6.9%, p=0.24).[2]

Among the 235 newborns in the study group 189 (80.4%) had one loop, 40 (17%) had two loops and 6 (2.6%) had three loops. Similarly Shrestha NS in their study found that single nuchal cord loops were more prevalent than the multiple nuchal cord loops.[11]

This present study although the incidence of meconium staining of liquor was more in study than control group, the difference was not significant. Similar results have been quoted by Spellacy et al.[20] Onderoglu LS et al.

stated that meconium staining of liquor is more common in newborns with multiple nuchal cord loops (31.3% vs. 15.6%, p=0.04).[2] Gurneesh et al. also stated that the meconium staining of liquor is common in newborns with nuchal cord loop (5.88% vs. 7.04%).[14] Assimakopoulos et al., Zahoor et al. and Rhoades DA et al. also suggest that the nuchal cord loop is associated with increased meconium staining of liquor.[12,15,10]

In the present study the foetal heart rate irregularities were more in study group than control group. Onderoglu et al., Ogueh et al., Gurunesh et al., Zahoor et al., Hankins et al. also suggest that the nuchal cord loops are associated with increased foetal heart irregularities.[2,4,14-16] On the other hand Mastrobattista JM et al. stated that nuchal cord loops are not associated with increased foetal heart rate irregularities.[17] Electronic foetal monitoring may be the reason for detecting more number of fetal heart irregularities in our study. Although Larson et al. stated that multiple nuchal loops are associated with abnormal foetal heart rate pattern.[11]

In our study the mean birth weight of the newborns were statistically similar in both study and control group. Similar result was observed by Carey et al. (3206 g or 3135 g vs. 3252 g; F=0.08, P=0.7).[18] On the other hand according to Lipitz et al. when the infants are weighing less than 2000 g. at birth the incidence of nuchal cord loop was significantly lower ($p < 0.0006$).[19] Ogueh et al. also stated that the birth weight was lower in newborns complicated with nuchal cord loop.[4] But increased birth weight in newborns complicated with nuchal cord loop was notes by Cohain.[13]

In our observation the difference of Apgar score at 1 minute between study and control group was statistically significant with P=0.033. Similar observation was made by Onderoglu et al. between the study & control group. Zahoor et al. found that even when the mean of both 1 and 5 min Apgar in both the groups were not significant, the newborns with nuchal cord loop who deliver vaginally tend to have low 1 minute Apgar score.15 The other studies by Assimakopoulos et al., Rhoades DA et al., Clapp JF 3rd et al., and Sepulveda W suggest that the nuchal cord loop is associated with increased incidence of low Apgar scores.[12,10,21] In our study there was no difference between the study and the control group in relation to potential of hydrogen, partial pressure of oxygen and carbon dioxide. According to Onderoglu et al, pH (7.32 vs. 7.30, p=0.048), PO_2 (37.4 ± 18.1 vs. 31.7 ± 14.4, p=0.01) and PCO_2 saturation (57.4 ± 21.8 vs. 48.3 ± 20.4, p=0.005) were significantly lower in neonates complicated with nuchal cord loop.[2] Zanjani et al found that mean pH (7.21 ± 0.1 vs. 7.28 ± 0.1) was significantly low in newborns with nuchal cord loop when compared with the control.[23] Similar findings like low pH and pO_2 in newborns complicated by multiple nuchal cord loops was also been quoted by Martin et al. [24]

CONCLUSIONS

With this study we concluded that nuchal cord loop per se does not increase the maternal adverse outcome. Although there were increase the foetal heart rate irregularities, meconium stained liquor and low Apgar score at birth in nuchal cord loop group, these difference was no significant in compare to new-born without nuchal cord loop.

As the prevalence of nuchal cord loop decreases with advancing gestational age, ultrasonographically diagnosed nuchal cord loop in early trimester needs to be re-evaluated in late trimester. Presence of nuchal cord loop at late trimester need to be monitored for the evidence of foetal acidosis during labour rather than opting for an elective caesarean section. Although new ultrasound technology (Doppler, 3D/4D, tomographic ultrasound imaging) are highly precise in diagnosing nuchal cord loop, doing elective caesarean section for ultrasonographically diagnosed nuchal cord loop only increases maternal morbidity without any significant neonatal outcome.

As the limitations of our study is smaller sample size, inter observer variation in managing patients; a well-designed multi-centric case control study is the need of the hour to find out the influence of nuchal cord loop on maternal and neonatal outcome.

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