

ASSESSMENT OF UMBILICAL CORD COILING INDEX AS A MARKER OF PERINATAL OUTCOME

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Abstract

Background: To assess umbilical cord coiling index as a marker of perinatal outcome. **Materials and Methods:** One hundred fifty antenatal women who went into labour were included. Umbilical coiling index (UCI) calculated as total number of complete vascular coiling/ total length of cord (cm) at the time of delivery. Based on UCI, three groups as normocoiled (10th- 90th percentile of the mean UCI), hypocoiled (UCI < 10th percentile) and hypercoiled (90th percentile of the mean) in group I, II and III respectively was formed. **Result:** The mean length of coil was 51.6 cm. The mean number of coil was 12.3 and UCI was 0.29 cm. Vaginal delivery was seen in 40, 34 and 30 and caesarean in 10, 16 and 20 in group I, II and III respectively. Heart rate was normal in 42, 36 and 38 and abnormal in 8, 14 and 12 in group I, II and III respectively. Birth weight was normal in 43, 42 and 40 and low in 7, 8 and 10 in 8, 14 and 12 in group I, II and III respectively. APGAR score was normal in 41, 38 and 35 and low in 9, 12 and 15 in group I, II and III respectively. The difference was significant ($P < 0.05$). Complications was GDM seen in 5, 3 and 2 and PIH in 2, 4 and 1 in group I, II and III respectively. Abruptio was seen in 10, 6 and 8 and Oligohydramnios was seen in 3, 2 and 3 in group I, II and III respectively. The difference was significant ($P < 0.05$). **Conclusion:** Abnormal umbilical coiling index was associated with several adverse antenatal and neonatal features.

INTRODUCTION

The umbilical cord is a trivascular conduit allowing the foetal blood to flow in to and from the placenta.^[1] A coil is defined as complete 360 degrees spiral courses of umbilical vessels around the Wharton's jelly. About 95% of the umbilical cords have coils and the origin of the coiling is unknown.^[2]

Conditions such as compression, vasospasm and knots of the cord results in distress of foetal. The size of cord is about 50-60 cms long and 1.2 cms wide. The size more than 100 cms is called log cord and less than 40 cms are short cords.^[3,4] It has been found that small cords are linked with irregularity in FHR, delaying second stage of labour, birth asphyxia, inversion of the uterus, abruptio of placenta, and herniation of cord etc. Excessive lengthy cord may lead to complications such as cord entanglement around the fetus, rupturing of the

umbilical cord, true knot, torsion and cord prolapse.^[5]

Hypocoiled and hypercoiled cords were defined as coils having UCI less than 10th percentile and more than 90th percentile respectively. Various reports have shown that abnormal coiling index is associated with adverse perinatal outcomes.^[6,7] We performed this study to assess umbilical cord coiling index as a marker of perinatal outcome.

MATERIALS AND METHODS

Study was done at tertiary care level hospital of central India from February 2022 to July 2022. After considering the utility of the study and obtaining approval from ethical review committee, one selected one hundred fifty antenatal women who went into labour. Patients' consent was obtained before starting the study.

Data such as name, age etc. was recorded. Parameters such as parity, anemia, pregnancy

induced hypertension (PIH), gestational diabetes mellitus (GDM), gestational age, premature rupture of membranes (PROM), mode of delivery, fetal heart rate (FHR) abnormalities, meconium- stained liquor (MSL), and postpartum hemorrhage (PPH) were noted. Neonatal factors like APGAR, birth weight, admission to neonatal intensive care unit (NICU), and congenital anomaly were also recorded. Umbilical coiling index (UCI) calculated as total number of complete vascular coiling/ total length of cord (cm) at the time of delivery. Based on UCI, three groups as normocoiled (10th- 90th percentile of the mean UCI), hypocoiled (UCI < 10th percentile) and hypercoiled (90th percentile of the mean) in group I, II and III respectively was formed. The results were compiled and subjected for statistical analysis using Mann Whitney U test. P value less than 0.05 was set significant.

RESULTS

The mean length of coil was 51.6 cm. The mean number of coil was 12.3 and UCI was 0.29 cm [Table 1].

Vaginal delivery was seen in 40, 34 and 30 and caesarean in 10, 16 and 20 in group I, II and III respectively. Heart rate was normal in 42, 36 and 38 and abnormal in 8, 14 and 12 in group I, II and III respectively. Birth weight was normal in 43, 42 and 40 and low in 7, 8 and 10 in 8, 14 and 12 in group I, II and III respectively. APGAR score was normal in 41, 38 and 35 and low in 9, 12 and 15 in group I, II and III respectively. The difference was significant ($P < 0.05$) [Table 2].

Complications was GDM seen in 5, 3 and 2 and PIH in 2, 4 and 1 in group I, II and III respectively. Abruptio was seen in 10, 6 and 8 and Oligohydramnios was seen in 3, 2 and 3 in group I, II and III respectively. The difference was significant ($P < 0.05$) [Table 3].

Table 1: Umbilical coil characteristics.

Parameters	Mean	SD
Length	51.6	4.2
Number of coils	12.3	1.7
UCI	0.29	0.14

Table 2: Assessment of parameters.

Parameters	Variables	Group I (50)	Group II(50)	Group III(50)	P value
Delivery	vaginal	40	34	30	0.02
	Caesarean	10	16	20	
Foetal heart rate	Normal	42	36	38	0.04
	Abnormal	8	14	12	
Birth weight	Normal	43	42	40	0.05
	Low	7	8	10	
APGAR	Normal	41	38	35	0.03
	Low	9	12	15	

Table 3: Assessment of antenatal complications

Complications	Group I	Group II	Group III	P value
GDM	5	3	2	0.05
PIH	2	4	1	
Abruptio	10	6	8	
Oligohydramnios	3	2	3	

DISCUSSION

Umbilical cord is vital to the development, well-being, and survival of the fetus, yet this is vulnerable to kinking, compressions, traction, and torsion which may affect the perinatal outcome.^[8,9] The umbilical cord is protected by Wharton's jelly, amniotic fluid, helical patterns, and coiling of vessels. The origin of umbilical cord coiling is unknown.^[10] Hypotheses include fetal movements, active or passive torsion of the embryo, differential umbilical vascular growth rates, fetal hemodynamic forces, and the arrangements of muscular fibers in the umbilical arterial wall.^[11] We performed this study to assess umbilical cord coiling index as a marker of perinatal outcome.

Our results showed that mean length of coil was 51.6 cm. The mean number of coil was 12.3 and UCI was 0.29 cm. Chitra et al,^[12] measured umbilical coiling index (UCI) postnatally and studied the association of normocoiling, hypocoiling and hypercoiling to maternal and perinatal outcome. The mean umbilical coiling index was found to be 0.24 ± 0.09 . Hypocoiling was found to be significantly associated with hypertensive disorders, abruptio placentae, preterm labour, oligohydramnios, and fetal heart rate abnormalities. Hypercoiling was found to be associated with diabetes mellitus, polyhydramnios, caesarean delivery, congenital anomalies, and respiratory distress of the newborn.

Our results showed that vaginal delivery was seen in 40, 34 and 30 and caesarean in 10, 16 and 20 in group I, II and III respectively. Heart rate was

normal in 42, 36 and 38 and abnormal in 8, 14 and 12 in group I, II and III respectively. Birth weight was normal in 43, 42 and 40 and low in 7, 8 and 10 in 8, 14 and 12 in group I, II and III respectively. APGAR score was normal in 41, 38 and 35 and low in 9, 12 and 15 in group I, II and III respectively. Tripathy S,^[13] in their study one hundred two umbilical cords of babies delivered either by vaginally or by lower segment caesarean section were examined. The mean Umbilical coiling index was 0.20 ± 0.08 . A significant relationship was found between hypocoiled cords and pregnancy-induced-hypertension (PIH) in mother and meconium staining ($p < 0.05$). Hypercoiled cords were associated with PIH in mother, preterm delivery and low birth weight ($p < 0.05$). APGAR score at 5min ≤ 6 was seen in hypocoiled cords. Our results showed that complications were GDM seen in 5, 3 and 2 and PIH in 2, 4 and 1 in group I, II and III respectively. Abruption was seen in 10, 6 and 8 and Oligohydramnios was seen in 3, 2 and 3 in group I, II and III respectively. Biradar et al,^[14] assessed the association between the length of the umbilical cord and the coiling index with the perinatal outcome. The cases were divided into three groups i.e., normocoiled, hypocoiled and hypercoiled and their association with the perinatal outcomes were assessed. The mean umbilical coiling index (UCI) was found to be 0.57 ± 0.18 coils per cm. Abnormal foetal heart patterns, oligo and polyhydramnios, hypertensive disorders, placental abruption, gestational diabetes mellitus, caesarean section rates, low birth weight and intrauterine foetal death had high correlation with hypocoiled and hypercoiled compared to normocoiled.

CONCLUSION

Abnormal umbilical coiling index was associated with several adverse antenatal and neonatal features.

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