



Umbilical Cord Coiling Index Sonographic Evaluation in its Relationship with Perinatal Outcome and Late Second Trimester

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Abstract:

Objectives: To assess the relationship between perinatal results along with umbilical cord coiling index derived from sonographer solutions.

Study Design: This predictive research was executed in the OBG department of radiology at Vinayaka missions Kirupananda Variyar medical college and hospital of Medical Sciences, Salem, India from April, 2021 to September, 2021. Of the 60 patients included in the study, single pregnancies with direct vaginal / LSCS babies, regardless of equality, with active delivery from the second trimester to final pregnancy. From the results of the ultrasound, the "umbilical cord coiling index" was correlated and calculated with different perinatal criteria such as equivalence, gestational hypertension (PIH), gestational diabetes (GD) and 1 gestational age (in weeks), Delivery method and Apgar score. Fisher tests and Chi-squared were assist to determine the importance of the parameter findings.

Results: The current results of the ultrasound evaluation show that the UCI provides a significant correlation with hypocrite coils (UCI> 90%), babies PIH (p-value <0.05), and GDM (p-value 0.044) Hypocoiled (UCI<10%) and Hypercoiled cords (p <0.05) were significantly related to the Apgar score (p less than 0.05).

Conclusion: hypercoiled Coils or UCI> 90% is associated with IUGR and is part of primary perinatal results such as PIH and GDM. Both hypocoiled and hypercoiled cords, and UCI <10%, linked to the Apgar score for the perinatal results, thus showing a greater correlation with the UCI index.

Keywords: Hypercoiling umbilical cord, Umbilical cord coiling index, Hypocoiling umbilical cord

Introduction:

The foetus's sustenance, growth, development, wellbeing, and survival are closely related to the umbilical cord (Mukunya et al., 2020). Regardless of its importance in helping the baby in the mother's womb, the cord is not protected against certain physiological issues

such as torsion, kinking, compression, and traction, leading to the perinatal result of deleterious. Since vessels are the more unprotected sector of the anatomy of the fetus. The coils total number associated with a specific cord is at the starting days of the gestation phase (Krzyżanowska et al, 2020).

The patterns underlying the development of coiling happen at the end of the third and second trimesters of pregnancy, which may be according to physiological obstruction of the cord and modulation of physiological changes in the cord during pregnancy's long duration. Typically, two umbilical arteries form a cylindrical helix around the umbilical vein, while three blood vessels run along with the helical fashions (Gupta et al, 2006). These fusions of the helical of the umbilical vessels are called the spiral course (Rana et al, 1995). The normal umbilical cord has one singular coil for every 5 cm of cord length (Predanic, 2005). Generally, the umbilical cord develops around 40 spirals in total, and there are straight portions, and in certain cases, there exists a reversal in the spiral direction under various segments within the umbilical cord (Edmonds, 1959). The coil typically has a 360-degree umbilical cord spiral course around Wharton's jelly (Khier & Elghazaly, 2015). Abnormal index of the umbilical cord includes the umbilical cord and hypocoiled (less than 10 percent cord) and hypercoiled cords (more than 90 percent cord). The unusual umbilical cord index has been calculated to be associated with prenatal effects (Ezimekhai et al, 2001). -

The current research aimed to analyze the perinatal effects through indices of abnormal umbilical cord among the maternal sample population comprising of patients who are reaching their late second-trimester phase.

Methods and Materials

This is a systematic study executed in the field of Gynecology and Obstetrics at Medical Sciences Institute, Chennai, Tamil Nadu, Salem, India from April, 2021 to September, 2021. The clearance of the ethical committee was acquired from the ethics committee and Research Council of Institute. Sixty active labor patients during the second trimester of pregnancy, parities irrespective, who have single pregnancies with naturally arrived

babies via the vaginal delivery/ LSCS, were involved in this study.

After isolating the baby's umbilical cord, the cord was cut close and tied to the baby as expected. The entire umbilical cord was assessed, involving the placental end of the cord and the length of the baby's umbilical stump. The total number of spirals or coils was calculated from the neonatal end from the cord of the placental end, and it was indicated in cm.

Aloka SSD-1200 or SSD-2000 High Target Modules (Aloha, Tokyo, Japan) all ultrasound evaluations were carry out using a second-trimester fetal morphology scan continuously equipped with a 5.0MHz curvilinear transducer. Views that are longitudinal at the umbilical cord level were acquired at the distance between the coils, and the highest magnification was estimated from the inner edge of the arterial wall to the next outer edge. UCI is described as the ratio of the normal distance between coil's two pairs. The clear photos were acquired perpendicular to the cord. First, ultrasound estimates of the intercoil distance (figure 1) were carried out between the three to two coils of the umbilical cord were made: (1) near the entrance to the fetal abdominal, (2) near the insertion of the placenta, and (3) both sites distance, In the cord middle (3). Then the UCI was decided by dividing the absolute coils total number divide by the total cord length in cm.

$$UCI = \frac{\text{Number of coils}}{\text{Total length of cord measured in cms}}$$

Later, at this time, perinatal factors such as ponderal index, Apgar score, meconium staining, and foetal weight were associated with UCI. As a result, the impact on perinatal results of umbilical vascular coiling was executed. Therefore, all kids and patients were take care until discharge from the hospital.

Results

Among 60 women patients who were studied, the UCI findings reported that only 7 were hypercoiled, 8 with hypocoiled and the remaining 45 patients were normocoiled (Figure 1). In terms of parity, it was reported from parity outcomes that primiparous was

reported among 31 and and multigravida were 29. In terms of age distribution among patients, it was observed that the majority (60%) of the patients were within 18-25 years, with conditions of hypercoiled and hypocoiled cord was reported and prevalent in almost all the age group examined (Table 1).

Table 1: Correlation between mother age during labour versus UCI.

Crosstab							
			Age			Total	P value
			18-25	26-30	31-37		
Coiling index	Hypercoiled	Count	3	2	2	7	P=0.439
		% of Total	5.0%	3.3%	3.3%	11.7%	
	Hypocoiled	Count	4	3	1	8	
		% of Total	6.7%	5.0%	1.7%	13.3%	
	Normocoiled	Count	29	13	3	45	
		% of Total	48.3%	21.7%	5.0%	75.0%	
Total		Count	36	18	6	60	
		% of Total	60.0%	30.0%	10.0%	100.0%	

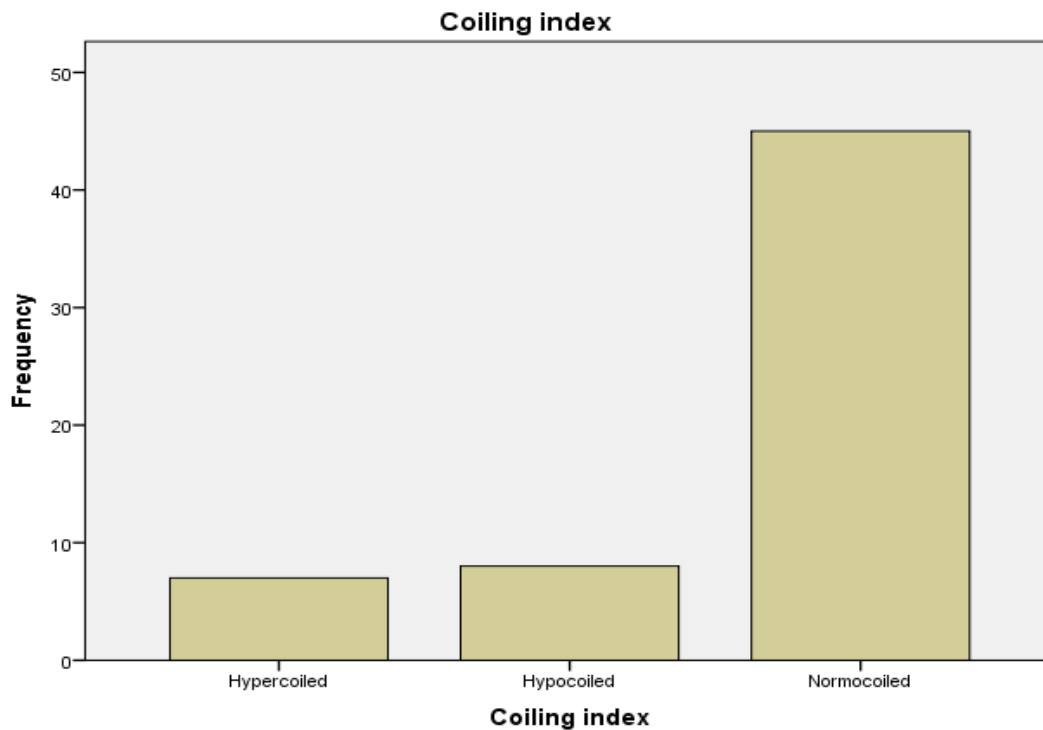


Figure 1: Distribution of UCI index

As for the delivery mode of the results, 36 women were delivered naturally, and 24 women who showed signs of LSCS deliveries had evidence of fetal distress. In the current research, <10% <0.06, UCI was examined hypocoiling, and UCI> 90% was percentile at 0.48, known as hypercoiling. PIH was found in 7 cases, which were hyper coil case (n-1) and hypocoiled (n-4). GDM cases were calculated in a ratio of 6 (n-2 per case) and most often

occurred in the normocoiled, hypercoiled, and hypocoiled cases. The Apgar score at 1 minute of <4 was found in 31 cases, and > 4 was found in 169 women cases.

Table 1 showed the relationship between perinatal results such as GDM and PIH. A UCI and hypercoiled of less than 10% associated with the Apgar score show a significant correlation with the list of sonographic results of the UCI index

Table 2: Correlation analysis between perinatal outcomes and UCI.

Cross tabulation		UCI			Total	p value
		Normocoiled	Hypocoiled	Hypercoiled		
PARITY	PRIMIPAROUS	24	4	3	31	.871
	MULTIGRAVIDA	21	4	4	29	
Total		45	8	7	60	
PIH	YES	2	4	1	7	.001**
	NO	43	4	6	53	
Total		45	8	7	60	
GDM	YES	2	2	2	6	.044**
	NO	43	6	5	54	
Total		45	8	7	60	
GESTATIONAL IN WEEKS	<37 WEEKS	3	3	1	7	.119
	37-40 WEEKS	33	5	5	43	
	>40 WEEKS	9	0	1	10	
Total		45	8	7	60	
MODE OF DELIVERY	VD	29	4	3	36	.458
	LSCS	16	4	4	24	
Total		45	8	7	60	
APGAR SCORE	Less than 7	3	6	4	13	.000**
	More than 7	42	2	3	47	
Total		45	8	7	60	

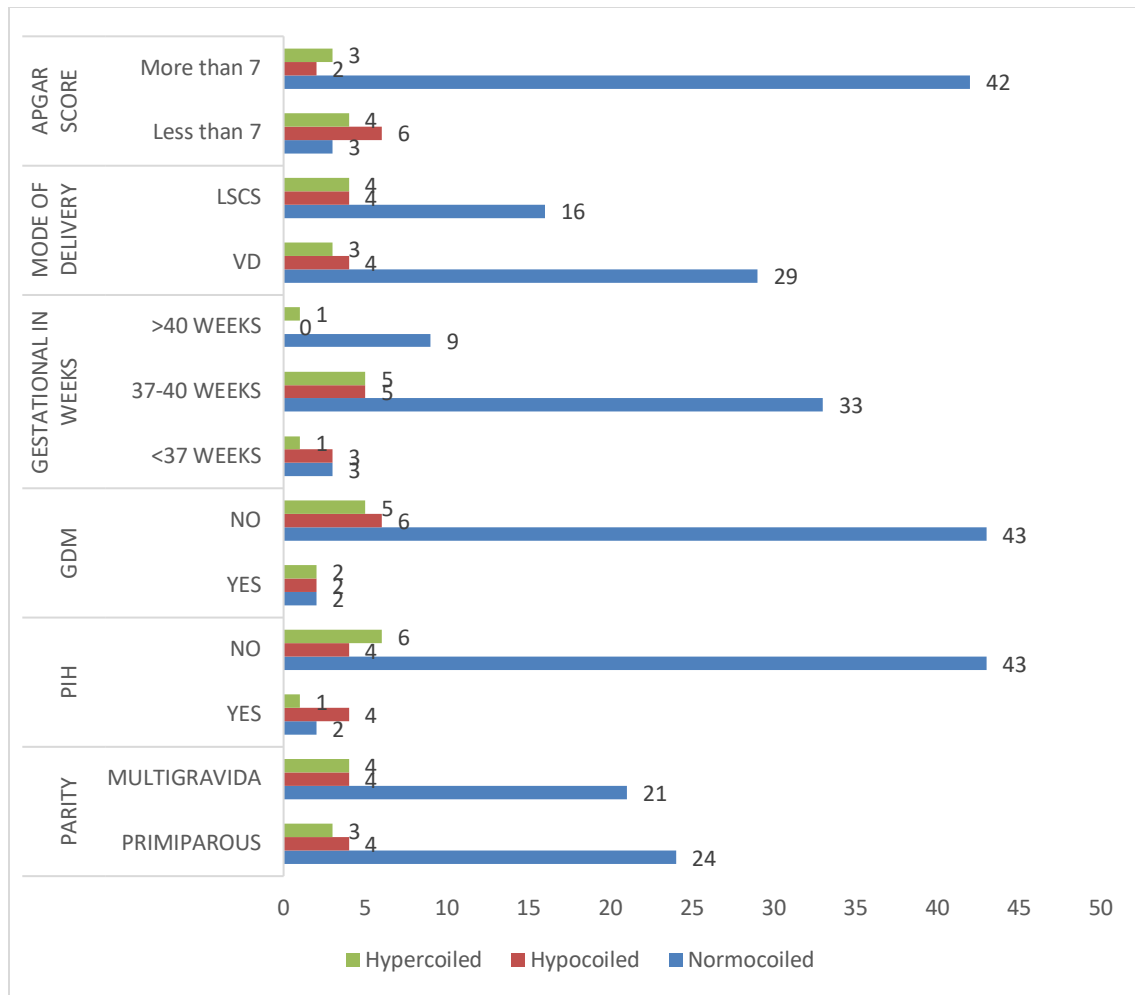


Figure 2: Graphical illustration indicating the perinatal outcomes and their distribution across UCI category

Discussion

The umbilical vessel by the spiral course was first recorded in 1521 by Berengarius. Arantius in 1564 and Columbus later confirmed it in 1559. In 1600, Fabricius revealed the existence of the umbilical cords' left (sinistral) and right (dextral) helices (Edmonds, 1954). If the umbilical cord is constant randomly twists, both types of twists will have the same frequency. Despite this, many researchers point out that the majority of chords are left-wing twists (Lacro *et al.*, 1987; Strong *et al.*, 1998). The number of changes in the first three months is usually equal to the term cords. After that, the number of the total coil is between 0

and 40. Umbilical coiling seems to confer turgor to the umbilical cord, resulting in a strong producing cord, still manageable. When the penis retracts from the end of the fetus, the curvature of the penis indicates a long record of fetal development (Strong *et al.*, 1998).

The coil is the 360-degree spiral course of the vessels of the umbilical. Umbilical cord index (UCI) is the number of the total coil divided by the total cord length in cm. Rana *et al.*, (1995) have completed this frequency UCI distribution.

From the assessment of several works of literature written to date, various trials in the past have examined the primary regards of

correlation to relationship between perinatal effects and UCI. In this review, some of the key UCI parameters assessed by sonographer results were taken into account by digitization. After comparing the UCI along with parity, it was found that there was no statistical importance between them. For example, pregnancies with high blood pressure and gestational diabetes mellitus (GDM) were primarily associated with the UCI assessment. For example, Diwakar *et al.*, (2017) results show that abnormal cord coiling in the two types is non-coiling, and hyper coiling is more likely to occur in women with gestational diabetes, supporting our conclusions. In addition, in the case of hypertension induced by pregnancy, there is complete protection against uteroplacental circulation due to the lack of adequate invasion of trophoblastic into the maternal spiral arteries result in lower blood flow around to the placenta to placental dysfunction and vascular lack which negatively impact the development of fetus Change in blood flow. (Chillakuru *et al.*, 2020) and its association with the hyper coiled cords lead to have a higher likelihood in its relationship impacts the umbilical venous blood flow. However, the association the limits of fetal development and between the hyper-coiled cords could not be explained due to minimum cases as stressed by Nishio *et al.*, (1999).

Gupta S *et al.* (2006) found lower Apgar scores on 107 umbilical cords and hypo coiled cords. Padmanabhan *et al.*, reviewed 130 umbilical cords were examined, and Apgar scores were mainly low in the hypo coiled group (Strong *et al.*, 1994).

In the current research, the UCI Apgar score of 5 min <7 was less than 10%. Monique WM *et al.* focused on 885 cases and establish that the hypo coiling was relationship with lower Apgar scores (Monique *et al.*, 2006). Gupta S *et al.* analyzed that Apgar Scores and analyzed 107 cords Children under 7 years of age have had lower UCIs than the children with Apgar

scores > 7 (Gupta *et al.*, 2006). 130 umbilical cords and a group of hypo coiled were associated with less than 7 Apgar scores was found by Padmanabhan LD *et al.*, (2001).

Conclusion

Based on UCI results and perinatal outcomes, unusual umbilical cord recording was linked with a fraction of negative perinatal effects such as PIH, GDM, and APGAR score. For UCI, more than 90% of hyper coiling is associated with limitations in fetal development. In this way, antenatal diagnosis of coiling index in the late second trimester or early assessment may be appropriate to diagnose efficacious fetal complications, which are at the problem and assist in further management.

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