

THE CORRELATION OF UMBILICAL CORD COILING INDEX WITH ADVERSE PREGNANCY OUTCOME IN BENT AL-HUDA HOSPITAL IN 2024

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Abstract:

Background: The umbilical coiling index (UCI) is an essential marker for monitoring the cord coiling by doppler antenatal assessment strategy. Cord coiling is leading cause for foetal vascular mal-perfusion and intra vascular thromboses especially in hyper coiled state. From academic standpoint, it is necessary to conduct an observational analytical study the correlation of the abnormal UCI with adverse pregnancy outcomes .

Aim: 1. Explore the correlation between adverse pregnancy of singleton pregnancy with abnormal umbilical cord coiling during the research period and by available resources in Bent AL-Huda Hospital in 2024.

2. General foetal health monitoring by precise scheduled ultrasonic antenatal care visits for the included pregnant mothers.

Method and material: An observational analytical study the correlation of the abnormal UCI with adverse pregnancy outcomes in Bent AL-Huda Hospital in 2024. A multistage cluster sampling method was conducted to recruit (150) pregnant mothers. The data gathered by survey questionnaire and processed by statistical analysis.

Results: The UCI values were about (79%, n =119) which was regarded as Normocoiled group and remaining (11%, n =16) were Hyper-coiled and (10% n =15) were Hypo-coiled groups in Bent AL-Huda Hospital in 2024. UCI has about (0.07) value as minimum and (0.63) as maximum vales. The mean SD of the UCI was 0.31 ± 0.05 with 95% confidence interval. The Mean of the UCI was the (0.24) by this study. There is a significant association between hyper- coiled group of the UC and IUGR (P-value 0.004). There is a

significant association (**P-Value =0.001**) between the Hyper-coiled group and CS deliveries with the percentage of (**31%: 5**) cases.

Keywords: *umbilical coiling index (UCI), adverse pregnancy outcome, and low birth weight LBW, Bent AL-Huda Hospital in 2024.*

Introduction

Introduction: Although the umbilical cord is a great unique and vital canal for foetal viability, umbilical vessels are so vulnerable part to compression kinking, torsion, and traction.^{7,8} Helical pattern represents the most characteristic features of umbilical vessels which involve of screw- form coils expressed as the 360-degree spiral vessels courses of around Wharton jelly.^{9,10:}

The index scope that lies below the **10th percentile (0.07 coils/cm)** has reported association with the foetal death, preterm delivery, trisomy, low 5 minutes **Apgar** score. Those Values which lies above the **90th percentile (> 0.30 coils/cm)** was associated with asphyxia, umbilical arterial **pH <7.05**, SGA, trisomy, and single umbilical artery.^{11,12}

Risk factors for the umbilical cord coiling and its related non-High -risk group adverse pregnancy outcome was covered by two aspects:

There is a same occurrence in dichorionic and monochorionic as well as monozygous and dizygous gestations.¹³

Wharton jelly architecture has an essential function in coiling pathophysiology. This role is mainly due to a specific component called hyaluronan which acts as causative factor for twisting affinity of umbilical blood vessels wall. ^{14,15}

The prevalence of hypo- coiled and hyper coiled cords accounted about (**7.5% - 16.0%**)^{16,17} and (**6.7% - 20.0%**)¹⁸ respectively by literature reports.¹⁹ By 7 weeks, about **95%** of foetuses have coiling cord nature with knowing that the first clue of coiling was established at the time of **28** days of gestation.^{20,21} Data show that less than (**60%-65%**) of coiling phenomena is Normocoiled cords.^{21,22}

According to ultrasonography data, umbilical cord twisting is developed as early as the **28** days of gestation.²³ Presumably during the **2nd** trimesters, the pattern of cord coiling is grossly developing and decrease as the pregnancy advances. ²⁴

By dividing the coil number to the length of cord the umbilical coiling index (UCI)is calculated which important illustrative parameter for coiling status. ($UCI = 1/\text{distance in cm}$).^{25,26} The mechanism by which physiologic coiling occurs remains undetermined with speculation that it may be related to early foetal activity and haemodynamic factors, or other anatomical issues such as the presence of Roach muscle.²⁷

There is a radiologic diagnostic entity by Doppler modality for cord coiling during antenatal care which include Hypo-, Hyper -and Normocoiled classification for umbilical blood vessels.²⁸ These entities account the major umbilical cord anomaly in the intrauterine life which regarded as a key tool for explanation the non-risky singleton pregnancy adverse fate.²⁹

In Iraq, the scheduled ultrasound examination represents an essential part of pregnant women's care. Unfortunately, it is customary that the performed radiological examination during the pregnant mother visit has no precise check-up and seldomly includes the calculation of the UCI as crucial marker in the vulnerable months to umbilical cord twisting.

From academic standpoint, it is necessary to conduct an observational analytical study to be a step in the way of answering the questions of this problem. It is enterprises in Nasiriya city within **Al - Nasiriyah city** within **Bent-Al-Huda Teaching Hospital**.

Methodology: An observational analytical longitudinal study for exploring the correlation of umbilical cord index with adverse pregnancy outcome which conducted in **Bent-Al-Huda Teaching Hospital** in Al-Nasiriya City in **2024**. It is directed to choose **(150)** participants. All the pregnant mothers who have been referred to or visited the included hospital during the time of sample collection to receive the requested antenatal care program by a specialised obstetrics and sonography units.

Diagnosed pregnant mother who had been organized in uniform schedule of antenatal visits for sonography unit in this study institutes by available (radiologist consultation, postgraduate student researcher, medical documents, or reports). The included pregnant mothers examined by the researcher under the supervision of available radiologist in sonography unit to prove radiological diagnoses for umbilical cord coiling by doppler modality. **Exclusion criteria:** Those who were absent for two consecutive visits within the timeframe of the study those pregnant mothers with high-risk group involvement diseases (all pregnancy effected chronic diseases or pregnancy induced disease or complicated pregnancy). Those with bad or recurrent adverse pregnancy outcomes.

Results: After gathering the data by suitable questionnaire, the information of result was organized in the tables and figures. About **(79%, n =119)** was regarded as **Normocoiled** group and remaining **(11%, N =16)** were **Hyper-coiled** and **(10% N =15)** were **Hypo-coiled** groups by conducting of this study in Bent AL-Huda Hospital in 2024.

Maternal factors had another statical concern in the correlation with antenatal umbilical cord indices. These were involved (age group, parity, delivery, delivery mode and amniotic fluid indices). There is a significant association between Hyper-coiled group with age group (20-34) years, P-value (0.0001). Maternal age is significant predictor value for the adverse pregnancy outcome with P-Value **(0.0001)** by using **Fisher test**.

The parity variable organized as **(1), (2)** and **(3)** which accounted for about **(68%), (26%)** and **(6%)** respectively. Furthermore, the delivery mode is divided to normal vaginal delivery (NVD) and caesarean section mode (CS) with **(75.3%)** and **(24.6%)** respective extent percentages in the total population. **P-Value** shows about **(0.0001)** by **Fisher Test** applying between the Hyper- coiled group and CS deliveries with significant association. **P-Value** shows about **(0.004)** by **Fisher Test** by applying between the Hyper-coiled group and IUGR with significant association.

Polyhydramnios with **(25≤)** AFI value accounted for about **(12.6% N=19)** of the studied total cases with the higher percentage **(18.7%)** in the hyper-coiled- mothers- group. it had a significant association with hyper-coiled with **(0.005)** p-Value. As the maternal factors, foetal and neonatal factors also statistically tested to umbilical cord scopes. These are consisting of (birth weight, neonatal admission, Apgar scores and foetal heart rate abnormalities), this explained in Table 2.

LBW account about (30%N= 45 cases) of the total population with a higher extent (32.8% N= 38) of the norm- coiled pregnancies. Three babies of the delivered with LBW for the hyper coiled umbilical cord women which account about (20%) of this group.

Acute Foetal Distress formed about **(20% N=3)** of both hypo- coiled and **(30.3% N=36)** cases of the normo- coiled groups. All the cord indices groups had a correlative fisher exact P-Value with **(<0.001)** in association with the mother group who delivered babies with NICU stay>24h. Low Apgar Score values accounted for about **(36%)** percentage of the total population of interest **(54 case)** with the highest presented extent **(53.4% N=8)** of the under- coiled group. The coiling index of the umbilical cord has been regarded be an effective marker of adverse pregnancy outcomes.

Several studies have been conducted to test correlation between UCI and numerous foetal and maternal factors.

Discussion: As mentioned in the result data in this study the normocoiled pregnancies accounted for about **(79%)** of total studied population. It was the highest extent among the groups which found to be associated mostly higher foetal adverse outcomes (**LBW, Lower Agar-Score values, and abnormal FHR**). This hypothesis agrees with (**Burcu Aydın Boyama ,2023**) study.³⁰ It is scientifically speaking that normo-coiling associated with the large extent of foetal complication due to the strengthen of umbilical cord vessels and hemodynamic mismatch.³¹

The maternal age group (**20-34 yrs.**) had the higher presentation extents of umbilical cord abnormalities while (**≥35 yrs.**) group had the lesser one by this study. This hypothesis higher number of pregnancies during this more active sexually and reproductive period of the female. This hypothesis agrees with similar studies of the (**Gopinath Subashini**).³²

In addition to the age groups, the mother parity had another resultant inference. **Para (1)** pregnant had the higher association with the **UCI** abnormalities more than **para (2)** and **para (3)** whom had the lesser and approximately an equal percentage among the different umbilical cord indices groups. This hypotheses by the result of this study agrees with study of (**Aydın Boyama B, Yılmaz Z**).³³

On the other sight, there is a significant association between hyper- coiled group of the UC and intra uterine growth retardation group of studied mothers. (**P-value 0.004**).

This agree with the study of (Monique W.M. de Laat 2007).³⁴

Amniotic fluid index (**≥25**) had a significant (**0.0001**) association with hyper-coiled group. As comparative discussion, this result is disagree with (**Maryam Kashanian 2006**).³⁵ This may be due that the studied cases were included perinatally. However, the study of (**Snoor Jalal Mustafa 2013**)³⁶ was agree with this hypothesis.

Hypo-coiled mothers' groups had no detected cases of oligohydramnios (**AFI ≤ 5**) and of polyhydramnios (**AFI ≥25**) within the hypo-coiled group according to the study of (Milani F, Hajar Sharami S Fatemeh Dalil Heirati ,2019) study. ³⁷

On the other theory, the fluid volume is directly proportional with the dynamic rotatory intrauterine foetal movement.³⁸ This theory is approved by the results of this study by significant association of oligo- and polyhydramnios with the hypo -coiling and hyper- coiling groups. Tahmasebi and Alighanbari conducted study use the cord thickness and observed that there is a statistically significant association between small cord thickness and low birth weight.³⁹

Goynumer et al improved that the cord thickness at early weeks of the second trimester had an accurate checking of pregnancy.⁴⁰

On the other statistical point of view, Apgar score is another foetal variable the tested in this research. There is a significant correlation of Low Apgar score values with the over -coiling and under-coiling scopes by (**0.47**) and (**0.14**) P-Values by Fishers exact test. The study of the (Enas Adnan Abdulrasul) agree with this result. But (Seyedeh Hajar Sharami1, Ehsan Kazemnejad Lili2, Fatemeh Ebrahimi1)⁴¹ had another presumption of on statistical relation between (LOW Apgar) and (UCI).

Furthermore, abnormal **FHR** is significantly correlated with the hypo coiling and hyper coiling scopes by P-Value (**0.001**) for both scopes of abnormal **UCI** by Fishers exact test. The study of (**Richa Sharma1, Gita Radhakrishnan1**) disagree with this result that did not find any association between abnormal UCI and foetal heart rate changes. This presumption is consistent the study of (**Chitra T, Sushanth YS, Raghavan**)⁴² and (**Mustafa SJ, Said AM.**).⁴³

UCI effects on neonatal adverse outcome was precisely analysed by logistic regression with **(0.05)** and **(0.1)** probability for entry and exit. UCI was regarded as predictor for neonatal complications.

		Hypo- coiled		Normocoiled		Hyper- coiled		Total	
Number		15	10%	119	79%	16	11%	150	100%
Age	20-34	9	60%	77	64%	11	70%	97	64.7%
	≥35	6	40%	42	35%	5	30%	53	35.3%
P- Value		0.0001							
Parity	1	9	60%	83	70%	10	62%	102	68%
	2	3	20%	33	28%	3	16.5%	39	26%
	3	3	20%	3	2%	3	16.5%	9	6%
P- Value		0.0001							
Delivery Mode	NVD	12	80%	90	76%	11	69%	113	75.4%
	CS	3	20%	29	24%	5	31%	37	24.6%
P- Value		0.047		0.030		0.001			
IUGR		3	20%	15	12.6%	5	31.2%	8	15.3%
P- Value		0.0162		0.040		0.004			
AFI at last visit	5 ≤	2	13%	25	21%	1	6.2%	28	18.6%
	P- Value	0.005				0.203			

Conclusions: The UCI is an essential predictor in sonographic antenatal care and monitoring for the adverse pregnancy outcomes as a null hypotheses and as statistical and significant parameter according to the results of the study.

Table1: Distribution of UCI Categories According to Maternal Factors in Bent AL-Huda Hospital in 2024.

	25≥	1	6.6%	15	12.6%	3	18.7%	19	12.6%
	P- Value	0.372				0.005			

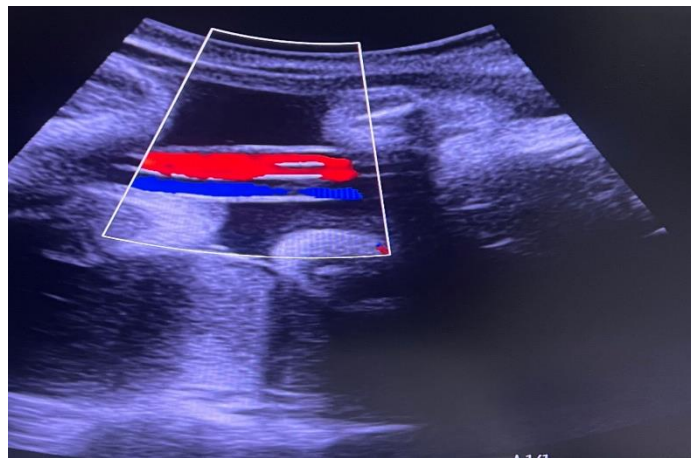
Table 2: Distribution of UCI Categories According to Fetal and Neonatal Factors in Bent AL-Huda Hospital in 2024

		Hypo - coiled		Normocoiled		Hyper coiled		Total	
Number		15	10%	119	79%	16	11%	150	100%
Birth Weight	Normal	12	80%	80	67.2%	13	81.2%	105	70%
	LBW	3	20%	39	32.8%	3	18.8%	45	30%
P- Value		0.011		0.060		0.014			
Respirat. Distress	Normal	12	80%	83	69.7%	11	68.7%	106	70.6%
	AfD	3	20%	36	30.3%	5	31.3%	44	29.4%
P- Value		0.48		0.040		0.300			
APGAR Score	Normal	7	46.6%	78	65.5%	11	68.7%	96	64%
	Low	8	53.4%	41	34.5%	5	31.3%	54	36%
P- Value		0.047		0.030		0.014			
Foetal HR	Normal	12	80%	110	92.4%	13	81.2%	135	90%
	Abnor.	3	20%	9	7.6%	3	18.8%	15	10%
P- Value		<0.001				<0.001			
Preterm birth		9	60%	30	25.2%	13	18.8%	52	34.6%
P- Value		<0.001		<0.001		<0.001			
NICU stay>24h		3	20%	42	35.2%	5	31.2%	50	33%
P- Value		<0.001							



Ultrasound Doppler examination of Umbilical Cord in supine position of 26 years pregnant woman in 20 weeks of gestation shows Hyper- coiling.

The measured distance between two coil is 2.7 cm. the calculated UCI is 1.8 coil\cm.



Ultrasound Doppler examination of Umbilical Cord in supine position of 33 years pregnant woman in 26 weeks of gestation shows Normo- coiling.

The measured distance between two coil is 17.8 cm. the calculated UCI is 0.28 coil\cm.

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