

ORIGINAL ARTICLE

Evaluation of Umbilical Cord Diameter and its Correlation with Birth Weight of Neonates: A Cross-Sectional Study from North India*Jaiprakash Narayan¹, Deepali Bangalia¹, Mahendra Nimel¹, Satyendr Sonkariya¹ and Pukhraj Garg¹**¹Department of Pediatrics, Jawaharlal Nehru Medical College, Ajmer-305001, Rajasthan, India.***Abstract:**

Background: There are few research publications in literature which put the relationship of umbilical cord thickness with birth weight of neonates. **Aim and Objective:** To evaluate the umbilical cord thickness and determine the correlation with birth weight of newborn. **Material and Methods:** This was a cross sectional analytical study conducted between December 2020 and January 2022 at Rajkiya Mahila Chikitsalaya, J L N Medical College, Ajmer, India. Three hundred and three neonates were enrolled for this study. Simple random sampling was done for this study. Umbilical cord thickness was measured just after delivery. **Results:** Mean umbilical cord diameter was 9.89 ± 2.53 mm. The thickness of umbilical cord of males and females were 10.3 ± 2.4 mm, 10.2 ± 2.3 mm respectively (p value=0.76). Birth weight was found to be positively correlated with the umbilical cord diameter ($r=0.236$; $p<0.001$). **Conclusion:** Thin umbilical cord is associated with low birth weight and its consequences.

Keywords: Birthweight, Neonates, umbilical cord, Umbilical cord diameter, umbilical cord thickness.

Introduction:

The neonatal outcome is affected by structure of placenta, umbilical cord structure, maternal risk factors and perinatal care. The umbilical cord length, diameter and area are morphometric parameters of umbilical cord. These are important predictor of in-utero environment and quality of pregnancy. All these are factors affect the neonatal outcomes [1]. The presence of a thin cord during pregnancy puts the fetus at risk of restricted growth and birth weight, classified as small for gestational age. Wharton's jelly is the content of umbilical cord. So, the cord diameter is also depending on the amount of Wharton's jelly. Reduction in the amount of Wharton's jelly decreases

diameter of the cord. Wharton's jelly protects the umbilical cord vessels. A reduction in its amount – due to extracellular dehydration or due to reduction in extracellular matrix – may predispose these vessels to compression or bending [2]. Reduction in wall thickness of the umbilical cord arteries and vein has been found in intrauterine growth retardation (IUGR) of infants with abnormal umbilical artery flow as compared to IUGR infants without increased umbilical artery resistance [3]. This cross-sectional study evaluates the association between umbilical cord diameter (UCD) and birth weight (BW) of neonates.

Aim and Objective:

To evaluate the umbilical cord thickness and determine the correlation with birth weight of newborn.

Material and Methods:

This was an analytical cross-sectional study which was conducted in the neonatal intensive care unit of a tertiary care center in north India. We measured the umbilical cord diameter of 303 newborn at Rajkiya Mahila Chikitsalaya, J L N Medical College, Ajmer, India, just after delivery. All patients were subjected to a protocol (as per proforma) which included a detailed clinical history of antenatal maternal risk factors and relevant examination. After delivery, umbilical cord diameter was measured for all neonates at 2.5cm above the base of cord at neonatal side by digital vernier caliper (accuracy up to 0.01 mm). Birth weight of the neonates was measured by using electronic weighing machine (accuracy up to 0.005 kg).

Baby born from mother's gestation age ≥ 34 weeks and Birth weight ≥ 1250 grams were included in the study.

Baby born from mother’s gestation age < 34 weeks and Newborn with Birth weight <1250 grams were included in the study.

The data was analyzed through Social Sciences (SPSS) Version 25. Mean values were compared using independent ‘t’ test or Mann-Whitney test based on the distribution of the data. Pearson’s correlation was used to calculate the correlation coefficient between umbilical cord diameter (UCD) and birth weight (BW). The confidence limit of the study was kept at 95% hence a “p” value less than 0.05 was considered statistically significant.



Sample selection - simple random sampling

Results:

Mean gestation age and birth weight were 37±2.1 week and 2.4±0.6 kg respectively in the study cohort. Mean umbilical cord diameter was 9.89±2.53 mm. There were 156 male and 147 female newborns in this study. We found that there was no difference in the thickness of umbilical cord between males and females (Males 10.3±2.4 mm, Females 10.2±2.3 mm; p value=0.76) (Table 1). Birth weight was found to be positively correlated with the umbilical cord diameter (r=0.236; p<0.001) (table 2) (Figure 1).

Table No.1: Umbilical cord thickness based on Gender

	Male (N=156)	Female (N=147)	p value
Umbilical cord diameter (in mm) Mean (SD)	10.351 (2.474)	10.268 (2.304)	0.76

Table No. 2: Correlation of umbilical cord thickness with neonatal parameters

	Umbilical cord diameter	
Birth Weight	r value	0.236
	p value	0.000
	N	303

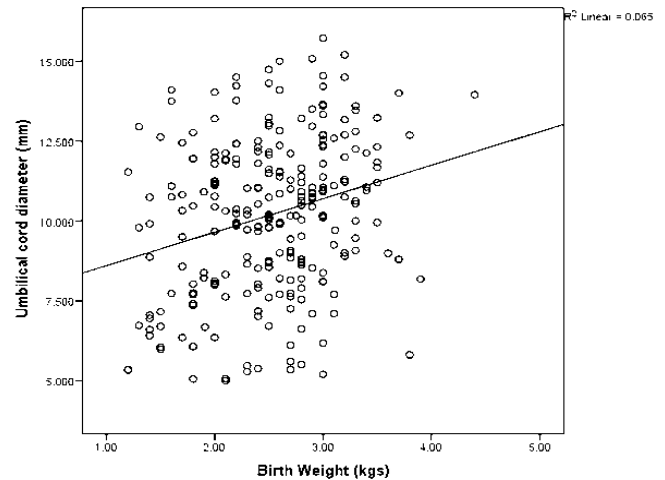


Figure No. 1: Scatter plot showing correlation between birth weight and umbilical cord diameter

Discussion:

This analytical cross-sectional study was conducted to determine the association between the umbilical cord diameter and birth weight of the neonates in the delivery room. The present study agrees with previous research that has shown association between umbilical cord thickness with Low birth weight (LBW) and meconium staining [4]. There was no difference in diameter of umbilical cord between male and female neonates. This is in contrast with previous studies which all reported thicker umbilical cord in males [5-8]. However, one study did not report any significant difference in umbilical cord diameter between male and female [9]. Birth weight was found to be positively correlated with the umbilical cord diameter (r=0.236; p<0.001). Previous studies including Togni et al, Sepulveda et al, Barbieri et al, Udoh et al and Elghazaly et al have reported similar correlation i.e., neonates with thin umbilical cord were LBW [5-7, 10, 11]. Elghalzaly et al even suggested formula to

calculate birth weight based on umbilical cord diameter [5]. For the neonatal weight estimation at the labor room, measure cord diameters in mm. Equation (neonatal weight in grams = cord diameter in mm × 300 grams). Lee et al also did not find any association between umbilical cord diameter and gestation [8]. LBW likely reflects a severe and long-term pathological process, which is more likely to be associated with decrease in the Wharton's jelly content of the umbilical cord. Goodlin et al in 1987 studied the correlate between umbilical cord diameter and the area of Wharton's jelly, fetal loss, premature birth, and inadequate fetal growth [12]. Predanic et al, Balkawade et al and Ismail et al also reported increased small for gestational age associated with thin umbilical cord [13-15]. In the study by Rigano et al, it was shown that there is a correlation between the decrease in umbilical vein diameter in fetuses with growth retardation and requirement of NICU care [16]. Comprehensive inclusion of antenatal risk factors and

measurement of umbilical cord diameter by digital caliper are strengths of this study while non-inclusion of preterm neonates, not doing serial assessment of fetal umbilical cord diameter by using ultrasonography are some of the limitations.

Conclusion:

It is concluded that reduction in umbilical cord thickness and diameter can compromise fetal growth. Thin umbilical cord is associated with low birth weight and its consequences. Reduced fetal growth has its own implications on immediate postnatal and long-term neonatal outcomes.

Abbreviations:

UCD - Umbilical cord diameter

BW - Birth weight

NICU - Neonatal intensive care unit

LBW - Low birth weight

Conflict of Interest - Nil

Sources of Support - Nil

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