International Journal of Reproduction, Contraception, Obstetrics and Gynecology
Makinde OI et al. Int J Reprod Contracept Obstet Gynecol. 2023 Mar;12(3):562-566
www.ijrcog.org
pISSN 2320-1770 | eISSN 2320-1789

DOI: https://dx.doi.org/10.18203/2320-1770.ijrcog20230519

Original Research Article

Maternal and fetal correlates of umbilical cord length in a sample of deliveries at a tertiary hospital in Southern Nigeria

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Received: 25 January 2023
Accepted: 10 February 2023

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ABSTRACT

Background: Long and short umbilical cords are associated with adverse perinatal outcome. This study aimed to determine whether umbilical cord length at birth has a correlation with maternal parity, maternal age, sex of the baby, birth weight, birth length and placenta weight.
Methods: A cross-sectional descriptive study conducted at the federal medical centre Yenagoa, Nigeria. Data collected using a pre-designed proforma was analysed using IBM SPSS statistics version 23.
Results: Mean age of the parturient was 31.1±4.4 years. Half were multiparous. Mean birth weight, birth length and placenta weight were 3.18±0.57 kg, 49.31±3.18 cm and 0.65±0.18 kg respectively. Mean umbilical cord length was 55.75±7.10 cm. There was a significant relationship and a positive correlation between umbilical cord length, parity (ɼ=0.39; p=0.001) and birth length (ɼ=0.27; p=0.024). Difference between male and female babies' cord length was not statistically significant (χ^2=0.36; p=0.721). There was no significant relationship between maternal age, birth weight, placenta weight and umbilical cord length.
Conclusions: Umbilical cord length increased significantly with increasing parity and birth length from this study. Women of increasing parity are therefore at increased theoretical risk of perinatal morbidity and mortality associated with long umbilical cords during labour and delivery. The relationship between cord length and birth length may be dependent on parity. This requires further study. There was no significant relationship between umbilical cord length and maternal age, sex of the baby, birth weight and placenta weight.

Keywords: Umbilical cord length, Parity, Fetal sex, Length at birth, Birth weight, Placenta weight

INTRODUCTION

The umbilical cord is an important part of the fetoplacental unit. In fact, it has been reasonably said that "the baby's life hangs by a cord".[1] Several abnormalities of umbilical cord may occur; related to its length, thickness, coiling, placenta insertion site, number of vessels, in-utero distortion and primary tumours.[2,3] The average length of the umbilical cord at birth is 55 cm with a diameter of 1-2 cm.[4] About 5% of umbilical cords are less than 35 cm and about 5% are over 80 cm in length. However, there are variations in the length of the umbilical cord ranging from no cord at all to as long as 300 cm.[4] The umbilical cord is said to be long when it is >70 cm[5] and short when it is <40 cm.[6] Both long cords and short cords are associated with adverse perinatal outcome.[5,6]

Cause of variation in umbilical cord length is yet unclear, however, the length of the fetus has been documented to reflect such characteristic as fetal movement.[4] It is believed that ample space in the amniotic cavity for fetal movement and the tensile force on the umbilical cord during such movements are two main factors that determine cord length.[7] Moreover, specific gene-mediated differences in protein expression pattern related to cell proliferation has been suggested.[4] Differences in umbilical cord length between male and female babies has also been documented.[8] Fetal sex goes beyond a random event of chance, perhaps it mediates the interactive process

between the mother, the placenta and the fetus.[9] A male fetus is associated with increased risk of prolonged pregnancy,[10] preterm labour, labour dystocia, true umbilical cord knots, cord prolapse, nuchal cord, abnormal fetal heart rate patterns and caesarean section etc.[7] Similarly, a female fetus is associated with altered fetal cardiac haemodynamics, increased risk of hypertensive diseases in pregnancy etc.[7] Additionally, fetal sex also has an influence on placental function.[7] The objective of this study is to determine whether umbilical cord length at birth has a correlation with maternal parity, maternal age, sex of the baby, birth weight, birth length and placenta weight.

METHODS

Study design

This was a cross-sectional descriptive study.

Study setting

Yenagoa is the capital city of Bayelsa State; one of the states in the oil-rich south-south geopolitical zone of Nigeria. Bayelsa State has a population of about 1,700,000.[11] The indigenous people of Bayelsa are collectively referred to as Ijaws and the state is also home to a sizable community of non-indigenous tribes including the Igbos, Ibibios, Efiks, Urhobos, Itsekiris, Isokos, Edos, Yorubas, Hausas etc. Most people in Bayelsa State engage in trading, subsistence farming and small-scale commercial farming. Others work in the state and federal civil service. Federal medical centre Yenagoa is a tertiary level health facility. Patients present directly and also by referrals from primary and secondary level state-owned health facilities, private hospitals in Yenagoa and its environs, and from traditional birth attendants in Yenagoa and its environs. Department of obstetrics and gynaecology conducts average of 1800 deliveries annually, but facility was just recovering from impact of COVID-19 at time of study.

Inclusion criteria

All women who delivered at federal medical centre Yenagoa in month of June 2021 and their babies were included.

Exclusion criteria

Women who had medical and/or fetal complications during pregnancy; preterm deliveries; still births or delivered babies with congenital anomalies, and their babies were excluded.

Data collection

All procedures performed in the study involving human participants were in accordance with the 2013 Helsinki declaration (the protocol for this study was approved by the research ethics committee, federal medical centre Yenagoa). Mothers gave consent for collection of data related to their babies for research purpose. A predesigned proforma was used to collect real time data on all included deliveries during the study period. Variables of interest collected for the study included patient's age, parity, sex of the baby, birth weight, umbilical cord length, birth length and placenta weight.

Immediately after each delivery, the umbilical cord was double clamped and cut between clamps. The baby was assessed for Apgar score and then handed to a midwife or paediatrician. Following delivery of the placenta, a measuring tape was used to take the length of the umbilical cord attached to the baby and that attached to the placenta and the values were summed up. The crown-heel length of the baby was taken with a measuring tape. A digital table-top baby weighing scale was used to take the weight of the baby after the umbilical cord had been clamped short (with a baby cord clamp) at about 5 cm from its attachment to baby. The untrimmed weight of placenta was also taken.

Data analysis

Data from study proforma was entered directly into IBM SPSS Statistics version 23 which was used for data cleaning and analysis. Categorical data like age group, booking status, parity, and fetal sex were summarized using frequencies and percentages. Continuous data like birth weight, placenta weight, cord length and birth length were summarized by mean and standard deviation. Umbilical cord was categorized as short when length is <40 cm, normal when cord length was 40-70 cm and long when length is >70cm. Proportion of babies with different categories of cord length was calculated to obtain the prevalence of short and long cord length among the study population. Relationship between cord length categories and fetal sex investigated using Chi-square test of proportion. Difference in mean of cord length between fetal sexes was explored using student's t test. Correlation analysis was carried out to assess the relationship between maternal parity, age, fetal length, fetal weight, placenta weight and cord length. Level of significance set at $p<0.05$.

RESULTS

Maternal characteristics

Of the 68 parturients that delivered during the study period, majority (45.6%) were aged between 31-35 years. The mean age of the women was 31.1 years with a standard deviation of 4.4 years. Fifty-one of them (75.0%) were booked for antenatal care. Half of the women were multiparous (Table 1). Sixty-six women (97.1%) had singleton pregnancies while 2 women had twin pregnancy.

Fetal characteristics

There were 70 babies from 66 singleton pregnancies and 2 twin pregnancies. Majority of the babies were male 54.3%. Mean birth weight, mean length at birth and mean placenta

weight was 3.18±0.57 kg, 49.31±3.18 cm and 0.65±0.18 kg respectively (Table 2). Umbilical cord length ranged between 33 and 80 cm. Mean cord length was 55.75±7.10 cm. Majority of the babies (92.9%) had normal cord length (40-70 cm), three (4.3%) had short umbilical cord and 2 (2.8) had long cords. The mean cord length among male and female babies was 56.03±7.21 cm and 55.40±7.07 cm respectively (Table 3).

Table 1: Maternal characteristics of parturient, (n=68).

Characteristics	N	Percent (%)
Age group (Years)		
21-25	9	13.2
26-30	18	26.5
31-35	31	45.6
> 35	10	14.7
Mean ± SD	31.1±4.4	
Booking status		
Booked	51	75.0
Unbooked	17	25.0
Parity		
Nulliparous	14	20.6
Primiparous	20	29.4
Multiparous	34	50.0

Table 2: Fetal characteristics of parturient, (n=70).

Characteristics	N	Percent (%)
Fetal sex		
Male	38	54.3
Female	32	44.7
Birth weight categories		
Low birth weight	8	11.4
Normal birth weight	57	81.4
Macrosomia	5	7.2
Birth weight (kg), mean ± SD	3.18±0.57	
Length at birth (cm), mean ± SD	49.31±3.18	
Placenta weight (kg), mean ± SD	0.65±0.18	

Maternal and fetal correlates of umbilical cord length

The difference observed between male and female babies' cord length was not statistically significant (χ^2=0.36; p=0.721), see Table 3. Table 4 shows that there was a significant relationship and a positive correlation between umbilical cord length at birth, parity (r=0.39; p=0.001) and length of the baby at birth (r=0.27; p=0.024).

Table 3: Relationship between umbilical cord length at birth and fetal sex.

Characteristics	Total, n=68 (%)	Fetal sex		Chi-square (p value)
		Male, n=38 (%)	Female, n=32 (%)	
Cord length pattern				
Short umbilical cord (<40 cm)	3 (4.3)	1 (2.6)	1 (3.1)	0.58 (0.792)
Normal umbilical cord length (40-70 cm)	65 (92.9)	36 (94.7)	29 (90.6)	
Long umbilical cord (>70 cm)	2 (2.8)	1 2.6)	2 (6.3)	
Mean cord length	55.75±7.10	56.03±7.21	55.40±7.07	0.36 (0.721)

Table 4: Maternal and fetal correlates of umbilical cord length at birth.

Characteristics	Correlation coefficient- r (p value)
Maternal features	
Maternal age (Years)	0.028 (0.821)
Parity	0.390 (0.001)
Fetal features	
Length at birth (cm)	0.274 (0.024)
Birth weight (kg)	0.225 (0.065)
Placenta weight (kg)	0.179 (0.145)

DISCUSSION

Abnormal cord length (long and short umbilical cord) is associated with antepartum and intrapartum complications and increased perinatal morbidity and mortality.[5,6,8] This study sought to determine the maternal and fetal characteristics that may increase the risk of long or short umbilical cords. The mean umbilical cord length of 55.75±7.10 cm and the range of 33 to 80 cm from this study compares closely to the finding from a similar previous study in the study centre.[12] Moreover, other results from the previous study in the centre by Allagoa and Kotingo also compares closely with that from this study.[12] The incidences of normal umbilical cord length, short umbilical cord and long umbilical cord were 92.4%, 4.3% and 2.8%, respectively in this study and 94.7%, 4.3% and 3.3%, respectively in the previous study. The mean birth weight and mean length at birth were 3.18±0.57 kg and 49.31±3.18 cm, respectively in this study and 3.1±0.6 kg and 48.9±3 cm, respectively in the previous study. Ogunlaja et al in their study in Ondo State, west of Nigeria also recorded similar values to that found in this study for mean umbilical cord length (51.50±6.67 cm), mean length at birth (49.75±2.40 cm) and mean birth weight (3.23±0.50 kg).[13] The mean cord length (57.87±12.6 cm) from the study of Agwu et al in the east of Nigeria is also similar to that from this study.[8] These highlighted similarities suggest that the umbilical cord length, birth weight and birth length of the majority of Nigerian babies from

apparently healthy pregnancies are distributed around a mean that can be determined by larger multicentre studies.

This study did not find significant sex difference in the umbilical cord length at birth. This corroborates several previous studies that had reported that umbilical cord length did not vary according to the sex of the baby.[1,14-17] However, there are studies that had reported differently. Agwu et al found that the mean cord length for male babies was significantly higher than that for female babies.[8] Linde et al[18] also established sex difference in cord length and reported that male babies have longer cords than females. In their study, fetal male sex was reported as a risk factor for a long cord while female sex was associated with short cord.

From this study, there was a significant positive correlation between umbilical cord length and length at birth, but no significant relationship was found between umbilical cord length, birth weight and placenta weight. Comparing our finding with findings from previous studies that assessed the relationship between umbilical cord length and birth weight, placenta weight and length at birth, the findings showed divergence. In the study by Balkawade and Shinde in Maharashtra India, umbilical cord length did not vary according to birth weight like in our study, but contrary to our finding, umbilical cord length also did not have a relationship with length at birth in their study.[15] Sharma and Soliriya in their own study in Rajasthan also in India, reported a positive correlation between umbilical cord length, birth weight, placenta weight, and length at birth.[16] In another study in Nigeria, a positive relationship between umbilical cord length and birth weight was found.[13] Linde et al also reported that large placenta and birth weight are associated with long umbilical cord.[18]

It was also found from this study that there was a positive correlation between umbilical cord length and parity, such that risk of long umbilical cord increases with increasing parity. This is in line with the finding of Linde et al that parity is a strong risk factor for long umbilical cord.[18] Other studies have also reported similar findings.[19,20] This study did not find a relationship between maternal age and umbilical cord length. Similarly, Linde et al after adjusting for maternal age established that the risk of long umbilical cord is associated with parity and not maternal age.[18] Conversely, Yadav et al in their own study found no relationship between umbilical cord length and parity.[21]

At the least, this study shows that women of increasing parity are at increased theoretical risk of perinatal morbidity and mortality associated with long umbilical cords during labour and delivery. Thus, monitoring of labour should be as intensive in multiparous women as in primigravida. So far, the results from studies on the relationship between umbilical cord length, birth weight, placenta weight and length at birth are divergent. The relationship between cord length and birth length may also be dependent on parity. Larger and stronger studies will be necessary towards establishing a consensus knowledge on the relationship between umbilical cord length, parity, fetal sex, birth weight, placenta weight and length at birth.

CONCLUSION

Mean umbilical cord length in apparently healthy babies in this sample of deliveries is comparable with that of babies in other parts of Nigeria. Umbilical cord length increased significantly with increasing parity and length of the baby from this study. Women of increasing parity are therefore at increased theoretical risk of perinatal morbidity and mortality associated with long umbilical cords during labour and delivery. The relationship between cord length and birth length may be dependent on parity. Studies to analyse birth length and parity as co-determinants or independent determinants of umbilical cord length are required. There was no significant relationship between umbilical cord length and maternal age, sex of the baby, birth weight and placenta weight.

ACKNOWLEDGEMENTS

Author would like to say thanks to Dr. Adedotun Daniel Adesina, a biostatistician with the department of medical services, Nigerian law school Yenagoa campus, Bayelsa State, for his contribution to data analysis.

Funding: No funding sources
Conflict of interest: None declared
Ethical approval: The study was approved by the Institutional Ethics Committee

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Cite this article as: Makinde OI, Osegi N. Maternal and fetal correlates of umbilical cord length in a sample of deliveries at a tertiary hospital in Southern Nigeria. Int J Reprod Contracept Obstet Gynecol 2023;12:562-6.