Original Article

Correlation between Umbilical Cord Length, Birth Weight and Length of Singleton Deliveries at Term in the Federal Medical Centre, Owo, Ondo State, Nigeria

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ABSRTACT

Background: The umbilical cord and placenta have been considered to significantly contribute to the perinatal outcome. However, in our environment attempt at exploring its use has been limited due to sociocultural believes. This study aimed to identify the relationship between the umbilical cord length, newborn length and weight.

Materials and Methods: The study population consisted of three hundred and five pregnant women who consented to participate in the study and had live singleton fetuses at term.

Results: The average birth weight was 3.23 ± 0.50 kilograms and the average baby's length was 49.75 ± 2.40 centimeters. The average umbilical cord length was 51.50 ± SD 6.67 centimeters'. There was a positive correlation between umbilical cord length and the length of the baby (r = 0.130, p = 0.024); likewise the umbilical cord length and the weight of the baby at birth (r=0.145, p=0.011). A positive statistical relationship was found between the birth weight and the birth length of the babies (r=0.498, p<0.001).

Conclusion: The umbilical cord length contributes significantly to determining the newborn weight and length.Health education on the relevance of proper examination of the placenta and umbilical cord by the health care givers should be instituted.

Key words: Umbilical cord length, Birth weight, Birth length.

The umbilical cord and placenta have been considered to significantly contribute to the perinatal outcome. However, in our environment attempt at exploring its use has been limited due to paucity of information on the value of the placenta and umbilical cord during antenatal period, this situation is further worsened due to the prevailing sociocultural believe which ensures that the placenta and umbilical cord is handed over to the relatives for immediate disposal following delivery of the baby. As a result of this attempt at using the placental and umbilical cord for biomedical research has been significantly limited. This is a major setback in this part of the world in view of the prevailing challenges of newborn and infant morbidity and mortality.

The length of the umbilical cord varies from no cord (achordia) to 300cm, with diameters up to 3 cm[1]. At term the typical umbilical cord is 55 to 60cm in length with a diameter of 2.0 to 2.5cm [2]. About 5% of cords are shorter than 35 cm, and another 5% are longer than 80 cm[3]. Though it is not fully understood what controls cord length, various authors correlate cord length with fetal activity and movement. It is suggested that sufficient space in the amniotic cavity for movement and the tensile force applied to the umbilical cord during fetal movements are two main factors that determine cord length[4].

An umbilical cord less than 40 cm is said to be short. Short umbilical cords are uncommon. They occur in approximately 6% of pregnancies[5]. This shortness can be

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real or apparent (due to cord loops or entanglement). The pathogenesis of short umbilical cords remains unclear. One prominent hypothesis to explain the ontogeny of the umbilical cord is the 'stretch hypothesis' which attributes the development of a short umbilical cord to intrauterine constraint[6].

The presence of a short umbilical cord has been associated with antepartum abnormalities and risk factors for complications of labour and delivery[7].

Long umbilical cords, defined as total length over 70cm are associated with a number of circumstances which can impact fetal life[6]. Long cords have both maternal and fetal associations. Maternal factors include systemic disease, delivery complications and increased maternal age. Fetal factors include fetal anomalies, increased birth weight and respiratory distress[8]. Infants with excessively long umbilical cords are found to be at significantly increased risk of brain imaging abnormalities and/or abnormal neurological follow-up[8].

In investigating the clinical significance of umbilical cord length in human pregnancies, a previous study found out that cord length was significantly related to birth weight[9]. They however found out that the umbilical cord length does not significantly correlate with maternal age and parity[9].

This study aims to identify the relationship between the umbilical cord length, newborn length and weight with the aim of contributing to improve newborn and child health.

This study was a cross sectional study carried out at the Federal Medical Centre, Owo which is a tertiary health centre in Ondo State, Nigeria. The institution serves as one of the major referral centres in South west Nigeria.

MATERIALS AND METHODS:

The study population consisted of three hundred and five pregnant women who consented to participate in the study and had live singleton fetuses at term (i.e between 37 and 42 weeks of gestation) during the period of study.

Inclusion criteria:

1. Singleton deliveries
2. Gestational age 37 – 42weeks
3. Deliveries via vaginal or abdominal route.

Exclusion criteria:

1. Multiple pregnancies
2. Previously diagnosed intrauterine fetal deaths
3. Preterm deliveries (i.e< 37weeks) or prolonged pregnancies (> 42weeks) gestations.
4. Patients who had their placentae manually removed.

All eligible women were informed about the study using the patient information sheet and were appropriately counseled. Patients who cannot read or write English had their questionnaires interpreted to them via trained interpreters.

Informed written consent was obtained.

All eligible women who gave informed written consent were recruited for this study which was carried out by the researcher and two other registrars, one from each firm. This was to reduce inter observer error as much as possible. Measuring tapes, a weighing scale and other materials like latex gloves were provided for the study.

Pregnant women who had ultrasound scan at term had the amniotic fluid volume assessed using the single largest pocket and the value obtained was noted.

Formal approval was obtained from the Health Research Ethics Committee of the Federal Medical Centre, Owo. Participation of patients in this study was voluntary, the data collected was only for research purposes. There was no transfer of cost to the participants. The participants were free to exit the study at any point if she deemed fit without any consequences.

Standard Operating Procedures:
Immediately after delivery, the umbilical cord will be clamped about 5cm from its attachment to the abdomen of the neonate and the neonate was handed over to the paediatrician for Apgar scoring. Paediatricians were present at all deliveries of the study subjects. Immediately after removal of the placenta, the length of the umbilical cord was taken using a tape measure, the length of the cut end attached to the fetus was added to the umbilical cord attached to the placenta. The weight of the baby was also taken using the weighing scale. For patients who had to undergo abdominal delivery, the examination of the umbilical cords will follow the same manner. The third stage of labour was actively managed. Universal precaution was followed at all steps.
Statistical analysis was done using Microsoft Excel (2010 version) and the Statistical Package for the Social Sciences (SPSS) version 20 (SPSS Inc, Chicago, IL, IBM version). Test of significant difference was done using Microsoft Excel and Pearson's correlations were done using SPSS. All charts were drawn with Microsoft Excel. Statistical significance was defined as $P < 0.05$.

RESULTS:
A total of 323 patients were enrolled for this study out of which 18 opted out hence did not have their data analysed. Of the 305 recruited mothers with complete data, One hundred and ninety three (63.3%) were booked (Table 1). Yoruba ethnic group accounted for 73.8% of the recruited patients (Table 1). Majority of the recruited patients were between the ages 25 and 34 years. (Figure 1) Two hundred and ninety one patients (95%) of these mothers were married in a monogamous setting while the remaining 14 (5%) were unmarried but had partners. The grand multiparous women were the least category of recruited patient when parity was considered; this category of women accounted for 28(9.2%) of the recruited patients (Table 1).

Table 1: Socio-demographic variables of respondents

Variables	Frequency	Percentage
Type of marriage		
Monogamous	267	87.5
Polygamous	25	8.2
Unmarried	13	4.3
Parity		
1	140	26.9
2 – 4	137	44.9
≥ 5	28	9.2
Ethnicity		
Yoruba	225	73.8
Igbo	52	17.0
Hausa	14	4.6
Others	14	4.6
Booking status		
Booked	193	63.3
Unbooked	112	36.7

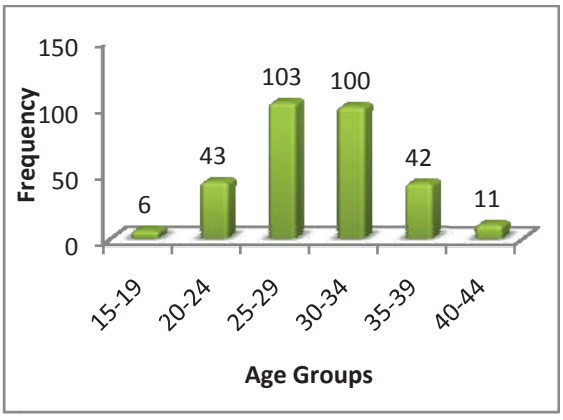

Figure 1: age group distribution of respondents. Majority of the respondents were between the ages of 25 and 34 years.

Of the 305 patients who completed the study, 261(85.6%) completed either their secondary or tertiary education (Figure 2). Majority of the respondents either had the secondary or tertiary level of education.

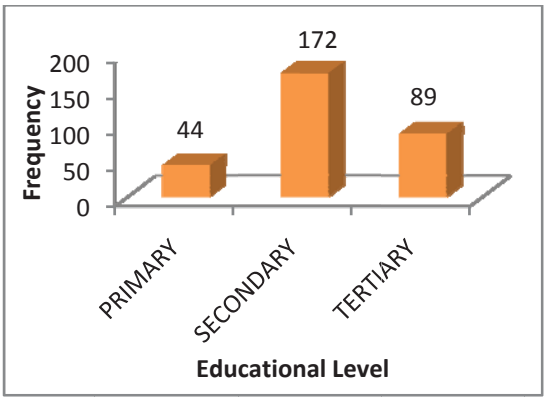

Figure 2: Educational level of respondents.

Two hundred and forty one (79%) had spontaneous vaginal delivery, while the rest had caesarean section. Table 3 showed that two hundred and eighty three babies had their birth weight in the range of 2.5kg and 4.0kg, the average birth weight was 3.23 ± 0.50 kilograms and the average baby's length was 49.75 ± 2.40 centimeters. The average umbilical cord length was 51.50 ± SD 6.67 centimeters. There were 2 arteries and 1vein in each of 304 umbilical cord examined, only one had a single umbilical artery and the birth weight of the baby with a single umbilical artery in it cord was 2.05kilograms.

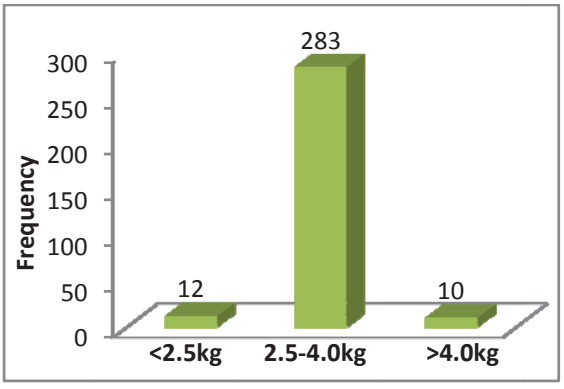

Figure 3: a bar chart showing the distribution of babies by birth weight.

There was a positive correlation between umbilical cord length and the length of the baby. (r = 0.130, p = 0.024). A positive relationship was observed between the umbilical cord length and the weight of the baby at birth (r=0.145, p=0.011); likewise a positive statistical relationship was found between the birth weight and the birth length of the babies (r = 0.498, p < 0.001). Two hundred and seventy pregnant women had ultrasound scan done at term which checked for the single largest pocket of amniotic fluid and it was correlated with the umbilical cord length. (r = 0.084, p = 0.167).

DISCUSSION:

There have been attempt aimed at establishing the link between the intrauterine and extrauterine life; hence, it is believed that a healthy intrauterine state should culminate in a healthy extrauterine state provided other confounding variables that may alter these factors are limited to the barest minimum. Hence, a need to fill this potential gap in knowledge was conceived. This study is aimed at establishing that important link by exploring the gross morphology of the umbilical cord in terms of its length and relating it to the perinatal outcome of newborns like birth weight and birth length at term in the Federal Medical Centre, Owo, Ondo State, Nigeria. This is with the goal of contributing to the improvement of fetomaternal medicine in our environment.

In our study the minimum umbilical cord length was 29.5 cm and maximum 100cm with a mean of 51.5±6.67cm, this is similar to values obtained in previous studies[2,10]. A mean cord length as reported in the literature was used as a marker to distinguish between short cords and long cords[11]. Umbilical cords of length up to 300cm have also been reported[1]. The prevalence of short cords in this study was 4.9% this was similar to the prevalence of 6% obtained in an earlier study[5], while that of long cord was 3.8%. The presence of short or long umbilical cord was not significantly related statistically to presence of congenital abnormalities in our study (p=0.13; p=0.17) respectively; this may be contrary to the findings of other

studies which showed some associations[6,7,8]. It was also observed that 91.3% of the umbilical cords examined fell within the normal range of cord length i.e 40 to 70cm. Ethnicity, parity and maternal age had no statistical significant relationship with the umbilical cord length, birth length and birth weight, this was similar to the observation made in a previous study[9].

In studying umbilical cord length as a correlate of perinatal outcome; our study revealed that cord length correlated significantly with babies length at birth ($r=0.130$, $p<0.024$). There was also a positive correlation between the umbilical cord length and the weight of the baby at birth($r=0.145$,$p=0.011$), this finding was also observed in previous studies[9,12]. Another important finding obtained from this study was the positive statistical relationship between the birth weight and the birth length of the babies. ($r=0.498$, $p<0.001$). There was a positive correlation between the umbilical cord length and the first minute Apgar score. ($r = 0.137$, $p =0.024$), the finding of the correlation of umbilical cord length with first minute Apgar score further supports the theory of umbilical cord length having an association with intrauterine fetal activity[4].

A Nigerian study of 1000 umbilical cords measured with both foetal and placental portions found a mean length of 51.5 cm[12]. There was a significant correlation with both infant and placental weight as well as continued increase in the mean until 42 weeks of gestation. An earlier Nigerian study of 602 cord lengths measured in labour and delivery had found a mean length of 57.5 cm, and had also found a correlation of length with infant and placental weight[13].

Although it is not fully understood what controls the cord length, various authors correlate cord length with fetal activity and movement. It is suggested that sufficient space in the amniotic cavity for movement and the tensile force applied to the umbilical cord during movements are two main factors that determine the cord length[2,4]. Hence, it has been postulated that the prevailing factors responsible for the lengthening of the umbilical cord in utero may also allow for proper fetal growth in terms of length and weight in utero. However, it was observed that of the 305 patients involved in our study, 270 had ultrasound scan done at term which checked for the single largest pocket of amniotic fluid and it was noticed that this had a weak positive correlation to the umbilical cord length and the overall association was not statistically significant. ($r = 0.084$, $p =0.167$).

Health education can go a long way in reducing or possibly eradicating the adverse sociocultural beliefs of the pregnant women and other members of the community. Of the 305 patients who completed the study, 261(85.6%) completed either their secondary or tertiary education (Figure 2). These shows that a great proportion of these women have the requisite education required to understand health information when communicated to them; therefore health care givers can seize advantage of this opportunity as a means to enhance health promotion.

The above findings revealed that the umbilical cord and its parameters are significant contributors to fetal health and this tool could be investigated from intrauterine periods using devices like the ultrasound machine to determine the health status of the fetus in utero and assist in reducing further chance of perinatal compromise by ensuring prompt treatment and management. This approach could also be a key for development to more chromosomal and genetic studies for early diagnosis of perinatal problems.

CONCLUSION:

The implication of the above observation is that the state of clinical finding of the

umbilical cord like the length has very important clinical correlates especially as it concerns the growth, wellbeing and the survival of the newborn. Efforts should be made to ensure that future research is focused on the umbilical cord and placental as it concerns newborn survival. Health care workers should be trained and retrained on this matter. Health education on the relevance of proper examination of the placenta and umbilical cord by the health care givers should be included in antenatal health talk given to pregnant women.

REFERENCES:

1. Valsamakis G, Kanaka-Gantenbein C, Malamitsi-Puchner A and Mastorakos G. Causes of intrauterine growth restriction and postnatal development of the metabolic syndrome. Ann N Y AcadSci 2006; 1092: 138-147
2. Yetter JF. Examination of the Placenta. Am Academy Fam Physician 1998; 57(5):1045-1054
3. Berg TG, Rayburn WF. Umbilical Cord Length and Acid- Base Balance at Delivery. J Reprod Med 1995; 40: 9-12.75
4. Benirschke K. The Umbilical Cord. NeoReviews. 2004; 5(4):34
5. Van den Broek N, Ntonya C, Kayira E, White S, Neilson J P. Preterm birth in rural Malawi: high incidence in ultrasound-dated population. Hum Reprod 2005; 20: 3235-3237
6. Baergen RN, Malicki D, Behling C, Benirschke K. Morbidity, mortality and placental pathology in excessively long umbilical cords: retrospective study. PaediatrDevPathol 2001; 4(2):144-153
7. Krakowiak P, Smith EN, de Bruyn G, Lydon-Rochelle MT. Risk factors and outcomes associated with a short umbilical cord. ObstetGynaecol 2004; 103: 1119-1127
8. Muppala H, Martinez JM, Comas C, Antolin E, Borrell A, Puerto B, Casals E, Mallofre MC, Bedoya-Ronga A, Martindale E. Abnormally long Umbilical Cord with marked Spiraling and True knots: A Case Report. The Internet J GynaecolObstet 2007;7:2
9. Wu JF, Chang SY, Hsu TY, Kung FT, Chan TC, Hsieh CH. Multivariate analyses of the relationship between umbilical cord length and obstetric outcome. Changgeng Yi XueZaZhi 1996; 19(3):247-252
10. Mutihir JT. Annals Of African Medicine, 2006.Vol 5, No.4 pp 192-196
11. Gupta S, Faridi MMA, Krishnan J. Umbilical Coiling Index. J ObstetGynaecol India 2006; 56(4):315-319
12. Adinma JI. The umbilical cord: a study of 1,000 consecutive deliveries. Int J Fertil Menopausal Stud 1993;38(3):175-179.
13. Agboola A. Correlates of human umbilical cord length. Int J GynaecolObstet 1978;16(3):238-239.