ORIGINAL ARTICLE

Umbilical Cord Length and Intra Uterine Wellbeing

by

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Abstract

The length of the umbilical cord was studied in 179 Indonesian newborns to determine the normal range of cord length and its influence on the occurrence of intrapartum complications such as meconium stained amniotic fluid, asphyxia and entanglement of the cord around the fetus. The authors also attempted to investigate whether unfavourable intra uterine conditions could influence cord length. Therefore a correlation between cord length, sex, gestational age, birthweight and headcircumference was sought. The mean length of the umbilical cord was 52.2 cm., with a S.D. of 10.2 cm, ranging from 31-100 cm. Male infants had significantly longer umbilical cords than females (p = 0.02). The risk of complications increased parallel with cord length.

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Introduction

The umbilical cord is the lifeline of the fetus. Abnormalities in the cord can influence fetal condition and can cause intrapartum complications such as fetal heart rate, abnormalities, asphyxia, delay in labor in cases of short cords, cord prolaps, knotting, torsion and entanglement of long cord (Rayburn et al., 1981). Others reported that short cords are due to diminished fetal movements (Miller et al., 1981). Sometimes a short cord is associated with slight motor or mental impairment in childhood (Naeve R.L., 1985). However, nothing is known about the normal range of cord length in Indonesia, nor if unfavorable fetal conditions influence umbilical cord length. The aim of this study is to determine the normal range of umbilical cord length and to investigate a possible relationship between cord length and head circumference, birthweight and gestational age, which are indicators of intrauterine wellbeing and the sex of the infant.

Materials and methods

Data were obtained from 228 of 305 live born Indonesia infants, delivered in the period between May-July 1989 in the Dr. Soetomo Genral Hospital, Surabaya, Indonesia. Selection was done at random and depended on the workload of the ward. Because of the small number of infants delivered by Cesarian section, prematurely delivered infants and infants who needed admission in a special care unit, all were excluded. Newborns delivered by natural childbirth were studied. Their gestational age ranged from 37-43 weeks. Only completely registered infants were studied by statistical analysis. This group consisted of 179 infants. Umbilical cord length was measured with a standard plastic measuring tape in the delivery room. The segments attached to the baby and to the placenta were measured without pulling, though after manipulation of the cord by Kustner's method (Kloosterman, 1985). The cord was clamped immediately 5 cm from the skin. Head circumference was measured fronto-occipital directly after birth. Gestational age was calculated from the first day of the last menstruation. When there was uncertainty about the gestational age the infants were scored using the method described by Dubowitz et al (1970). Birthweight was measured directly after birth. In this study the authors considered asphyxia, entanglement of the cord around the fetus and meconium stained amniotic fluid as *Complications*. Other complications related to umbilical cord abnormalities such as knotting, cord prolaps, fetal heart rate abnormalities and rupture of the umbilical cord, dit not occur in this study. The influence of sex, birth weight, head circumference and gestational age on cord length was analysed by a stepwise multiple regression. The influence of abnormal cord length on the occurrence of complications was analysed by a logistic regression.

Results

The total number of infants available for analysis was 179. The umbilical cord length ranged from 31-100 cm, with a mean of 52.2 cm and a SD of 10.2 cm (figure 1). Birthweight ranged from 2040-4300 g, with a mean of 3084 g and a SD of 390 g. Head circumference range from 30-37 cm, with a mean of 33.3 cm and a SD of 1.3 cm. Gestational age ranged from 37-43 weeks with a mean of 39.5 weeks. With stepwise multiple regression analysis (Table 1) a statistically significant correlation between sex and cord length was shown (male infants had a mean cord length of 54.4 cm, compared with 50.7 cm in female infants; $p = 0.02$, $z = 2.44$). There is a linear correlation between cord-length and the occurrence of complications such as asphyxia, stained amniotic fluid and entanglement. This correlation is statistically significant ($p = 0.02$). An increased risk of complications due to a short umbilical cord could not be found.

Discussion

There are several reports about the length of the umbilical cord. Tension is mentioned to be the basis of cord growth (Miller et al., 1982) while a short cord is said to be due to decreased fetal movement (Miller et al., 1981). Others concluded that the umbilical cord length might have a predictive value on the neurological development of the infant (Naeve, 1985). He found that short cords correlated with an increased frequency of mental or motor impairments in childhood (age 4 and 7 years resp.). Lubcenco et al. (1963) postulated the importance of birthweight as parameter of intrauterine condition. In this present study the authors found that birthweight, head circumference and gestational age could be used as parameters for the prediction of the intrauterine wellbeing. No correlation was found between any of these factors and umbilical cord length. This is consistent with Walker et al's finding (1960) that in the last trimester there was no correlation with gestational age nor with birthweight. But in contradiction with their findings that there was no correlation with sex, this study showed that males have a significantly longer umbilical cord than females ($p = 0.02$, $= 2.44$). Thus this finding with a small number of infants studied showed that sex has an important influence on cord length. Naeve (1985) found the same results. He also added maternal pregravid weight, maternal height, socio-economic status and pregnancy weight-gain as factors which influence cord length. As the case is in our study he could not find a correlation with head circumference and birthweight. Other studies reported that long cords can lead to cord prolaps, torsion, knotting and entanglement; short cords are associated with a delay in labour, fetal heart rate abnormalities, placental abruption, rupture of the umbilical cord, asphyxia, and umbilical hernia's (Rayburn et al., 1981). Entanglement in turn may cause greater tension to the cord, which can result in additional cord growth (Miller et al., 1981). In this study, with a relatively small number of sample studied, most of these complications did not occur; only entanglement, stained amniotic fluid and asphyxia were observed in 22 infants. These complications could significantly be related to longer cords ($p = 0.02$). The authors might conclude that long cord more frequently leads to complications, but the risk on complications is not much increased.

Figure 1 : *Length of the umbilical cord in Indonesian newborns n = 179*

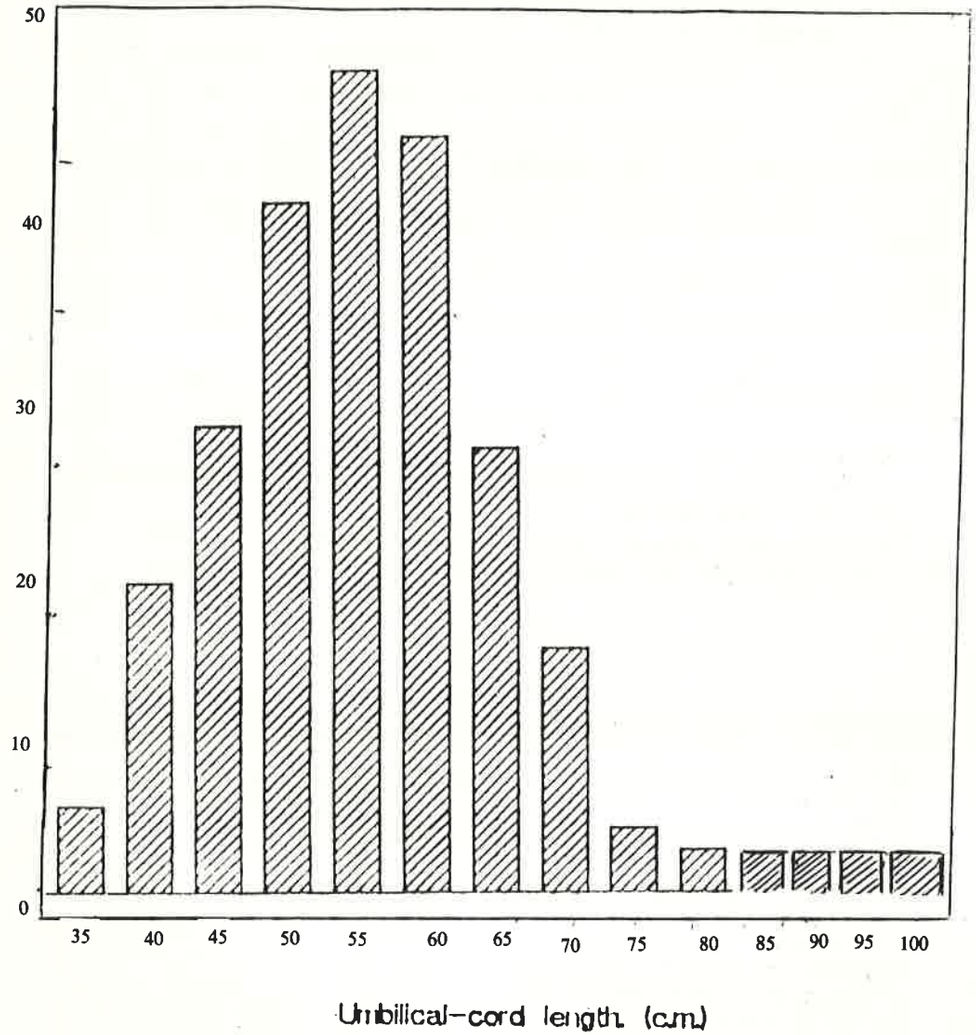

Table 1 : *Stepwise multiple regression analysis of factors influencing the length of the umbilical cord. n = 179.*

Factors	Length U.C. (cm)	Coefficient (SE)	Z	P
	m.52.2 SD 10.2			
SEX male / Female		3.73 (1.53)	2.44	0.02
birthweight* (kg)		−0.93 (2.53)	−0.37	0.71
Headcircumference** (cm)		−0.30 (0.75)	−0.40	0.69
Gestational age*** (wk)		0.53 (0.63)	0.85	0.39

* Birthweight = (birhtweight − 3)

** Headcircumference = (headcir. − 33)

*** Gestational age = (gest. age − 40)

REFERENCE

1. DUBOWITZ, L.; DUBOWITZ, V.; GOLDBERG, C. : Clinical assessment of gestational age in the Newborn infant : J. Pediat. 77 : 1 (1970)
2. KLOOSTERMAN, G.J.: De voortplanting van de mens, Leerboek voor Obstetric en Gynaecologie; pp 253 (Uitgevers maatschapy Centen Bussum 1985).
3. LUBCHENCO, L.O.; HANSMAN, C.; DRESSLER, M.; BOYD, E. : Intra Uterine growth as estimated from liveborn birthweight data at 24-42 weeks of gestation. Pediatrics 32: 793 - 800 (1963).
4. MILLER, M.E.; HIGGINBOTTOM, M.; SMITH, D.W.: Short Umbilical Cord, its origine and relevance. Pediatrics 67 : 816-821.
5. MILLER, M.E.; JONES, M.C.; SMITH, D.W.: Tension : the basis of umbilical cord growth. J. Pediat. 101 : 844 (1982).
6. MILLS, J.L.; HARLEY, E.E.; MOESSINGER, A.C.: Standards for measuring umbilical cord length. Placenta 4 : 423 - 426 (1983).
7. NAEVE, R.L.; Umbilical cord length : clinical significance. J. Paediat. 107 : 278-281 (1985).
8. RAYBURN, W.F.; BEYNEN, A.; BRINKMAN, D.L.: Umbilical cord length and intrapartum complications. Obstet. Gynecol. 57 : 450-452 (1981).