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DEPARTMENT OF HUMAN ANATOMY

MORPHOLOGICAL VARIATION OF THE UMBILICAL CORD AND ITS CLINICAL SIGNIFICANCE

AT KOREM GENERAL HOSPITAL, SOUTHERN TIGRAY, ETHIOPIA, 2024/2025: DESCRIPTIVE CROSS-SECTIONAL STUDY

BY

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A THESIS SUBMITTED TO DEPARTMENT OF HUMAN ANATOMY, INSTITUTE OF BIOMEDICAL SCIENCES, COLLLEGE OF HEALTH SCIENCES, MEKELLE UNIVERSITY IN PARTIAL FULLFIIMENT OF THE REQUIREMENTS FOR THE MASTER'S DEGREE IN HUMAN ANATOMY

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MEKELLE, TIGRAY, ETHIOPIA

COLLEGE OF HEALTH SCIENCES

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Master's Thesis Submission Form

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Full title of the Thesis Research	Morphological Variation Of The Umbilical Cord and Its Clinical Significance Among Mothers Delivered at Korem General Hospital, Southern Tigray, Ethiopia: Institution-Based Descriptive Cross-Sectional Study
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Study Area	Korem General Hospital (Public), Southern Tigray, Ethiopia
Total Budget of the study	25,000 Ethiopian Birr
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Examiners' Approval Sheet

We, the undersigned, members of the Board of Examiners of the final open thesis defense by "Fantahun Berihun Misgun," had read and evaluated his thesis "Morphological Variation Of The Umbilical Cord and Its Clinical Significance Among Mothers Delivered at Korem General Hospital, Southern Tigray, Ethiopia, 2024/2025, Descriptive Cross-Sectional Study." and evaluated the candidate. This is therefore to certify that the thesis has been accepted in partial fulfillment of the requirements for the MSc. degree in Human Anatomy.

Name of Chairperson	Signature	Date
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Final approval and acceptance of the thesis is contingent upon the submission of the final copy of the thesis to the candidate's Department through the office of the Department Graduate Program Coordinator.

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Certification of the final thesis

I hereby certify that all the corrections and recommendations suggested by the Board of Examiners are incorporated into the final thesis entitled “Morphological Variation Of The Umbilical Cord and Its Clinical Significance Among Mothers Delivered at Korem General Hospital, Southern Tigray, Ethiopia, 2024/2025, Descriptive Cross-Sectional Study”, By Fantahun Berihun Misgun

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Department Head Signature Date

Stamp of the Department of Human Anatomy

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LIST OF ABBREVIATIONS

UCI -	Umbilical Cord Index
IUGR -	Intra Uterine Growth Restriction
NICU -	Neonatal Intensive Care Unit
PRUV -	Persisting Right Umbilical Vein
IVF -	In Vitro Fertilization
A UCI -	Antenatal Umbilical Cord Index
P UCI -	Postnatal Umbilical Cord Index
APGAR -	Appearance, Pulse, Grimace, Atony, Respiratory

ABSTRACT

The umbilical cord is the vital connection between the fetus and the placenta. The umbilical cord plays a vital role in fetal development, supplying oxygen and nutrients from the placenta to the fetus. Different literatures show umbilical cord has morphological variations and it has an impact on birth outcome, despite it is not studied yet in our area which is the reason for the need of the study.

OBJECTIVE: The aim of this study is to investigate the morphological variation of the umbilical cord in terms of length, number of vessels, coiling pattern and other abnormalities like cord knot and cord entanglements.

METHODOLOGY**:** Descriptive study design was employed analyzing on 442 umbilical cords collected from Korem General hospital. The data was collected through direct observation and measurement . statistical measures such as mean, range, mode and standard deviation, and frequency distribution were used for analysis.

RESULT: The findings reveal that the average length of the umbilical cord was 50 cm, with a range of 35 cm to 78 cm. Most umbilical cord (99.5%) exhibits three vessel patterns, while 0.5% showed variations such as four vessel patterns with no two-vessel pattern. Majority (69%) of the umbilical cords had normal coiling pattern and 17% and 14% were hypocoiled and hypercoiled respectively. Additionally, 88% (392) of the umbilical cord had not had any cord knot whereas the 8% (36) and 3.2% (14) had cord knots and true cord entanglement respectively.

CONCLUSION: The study show umbilical cord varies morphologically in length, coiling vasculature, knot and entanglement and has an impact on birth outcome. So, it gives an input for clinical anatomy and embryology. In addition to this the medical students will benefit from this as it will help them in their medical intervention. Further research with a large sample size is recommended to explore the clinical significance of those variations.

KEY WORDS**:** Morphological variation, *Umbilical cord, cord length, coiling pattern, vascular pattern.*

1.INTRODUCTION

1.1 Background of the study

Umbilical cord is a soft tortuous cord with outer covering of smooth amnion which extends from the umbilicus of the fetus to the placenta. It is a made up of a single layer of amniotic epithelium within which are two arteries and one vein embedded in a gelatinous Wharton's jelly which consists mainly of mucopolysaccharides. It develops from the extra embryonic mesoderm and begins in the embryologic period around week 3 with the formation of the connecting stalk (1).

By week 7, the umbilical cord has fully formed, composed of the connecting stalk, vitelline duct, and three umbilical vessels surrounded by the amniotic membrane with the umbilical vein carrying oxygenated blood with nutrients from the placenta to the fetus and the umbilical arteries carrying deoxygenated blood with waste products from the fetus to the placenta. The umbilical cord is considered both the physical and emotional attachment between mother and fetus. On the other hand, mothers associate an emotional connection to the fetus through the cord. It may merit consideration as the route of love and care during pregnancy. Thus, some poets call it the string of life (1).

However, after birth, a significant distal part of the umbilical artery degenerates. These remnants later obliterate, forming the medial umbilical ligament (2). At the same time, the proximal portion of each umbilical artery serves as a branching point for the development of the anterior internal iliac arteries. The internal iliac arteries later give rise to the superior vesical arteries that supply the urinary bladder and ureters as well as the ductus deferens and seminal vesicles in males (3, 4).

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At term the normal umbilical cord is about 55-65 cm in length with a diameter of 2.0-2.5cm which normally inserts centrally or eccentrically on the fetal side of the placenta. It also allows free movement of the fetus within the uterus and protects the umbilical blood vessels from mechanical injury. Due to its peculiar role of being the link between the placenta and the fetus, any abnormality of this cord be it in length, the amount of Wharton's jelly, the number of vessels or its amniotic epithelium may lead to abnormal fetal outcome. Short umbilical cords (i.e. <40cm) are associated with neuropathic diseases, prolonged second stage of labour, cord rupture and placenta abruption. In contrast, long cords (i.e.>70cm) which are usually due to hyper-kinesis are associated with cord thromboses, entanglement.

Thus abnormalities in cord length associated with intrauterine factors could lead to abnormalities that are only detected later in life suck as Neurodevelopmental Disorder(cerebral palsy,developmetal delay, and possible autism spectrum disorder) (6).

1.1.1 Anatomical Features of an Umbilical Cord

Its length ranges from 50 cm to 60 cm, with a diameter of about 1 cm (6). The umbilical cord is composed of a gelatinous ground substance called Wharton's jelly. As previously mentioned, three vessels comprise the umbilical cord: two umbilical arteries and one umbilical vein. Commonly, the umbilical cord coiling pattern has a UCI of 0.2 coil/cm. It also encloses the urachus (a remnant of allantois) (7). However it may vary in its coiling pattern, length, vascular pattern, knot and entanglement and has an impact on fetal development such as fetal distress,intra uterine growth restrictions, cord knot and entanglement, so it needs early detection, because it might have an impact on fetal development and community health (20).

1.2. Problem Statement

One of the most common morphological variations of the umbilical cord is its different helical coiling patterns. The degree of coiling is measured by the umbilical cord index (UCI). Commonly, the umbilical cord coiling pattern has a UCI of 0.2 coil/cm. The rope model is considered the most common pattern of umbilical cord coiling. On the other hand, hyper-coiling of the umbilical cord is defined as having a UCI greater than 0.3 coil/cm and a relatively high incidence of about 6% to 21% of all pregnancies (18). Also, the umbilical cord can coil in an undulating pattern that has a relatively high incidence compared to other coiling patterns, such as segmented or linked coiling of the umbilical cord. It was found clinically that abnormal coiling of the umbilical cord is closely associated with the fetal vascular obstruction, which in its role can eventually lead to fetal thrombi, avascular villi or villous stromal vascular karyorrhexis that commonly occur with segmented coiling pattern of the umbilical cord (19).

Umbilical cord can also vary in its vascular pattern. Normally umbilical cord anatomy consists of three vessels represented by two umbilical arteries and one umbilical vein. By the seventh week of gestation, the right umbilical vein of a former two umbilical vein usually obliterates, leaving a single (left) umbilical vein patent. However, there have been documented cases of umbilical cords containing four vessels. The persistence of two umbilical veins and two umbilical arteries within the umbilical cord is associated with multiple cardiovascular and gastrointestinal anomalies (29).When both the right and left umbilical vein remains open, this a condition called persistent right umbilical vein (PRUV). This condition usually happens due to a deficiency in folic acid during the first trimester of pregnancy. This condition may cause teratogenic effects for the fetus and act as a risk factor for its overall physical health (30).

The other variations of the umbilical cord is its length which is considered significantly short when its length is less than approximately 40 cm. A short umbilical cord can lead to premature separation of the placenta resulting in an interruption in fetal circulation and, as a result, intrauterine bleeding followed by fetal death (32).

If an umbilical cord is longer than 65 to 70 cm, it is clinically considered long. An abnormally long umbilical cord has the greater potential to wind around the fetus multiple times contributing to fetal death, or it may also protrude from the mother's cervix at rupture of membranes (32).Despite those variations can lead to serious fetal and maternal health problems ,it is not yet studied in our community which drives me to select this topic.

1.3. Literature Review

A study done by Baergen et al. shows that the mean length of the umbilical cord is found to be 37 cm (47) which disagrees with the study done by Rohinidevi et al. in which the maximum length was 73.4 cm and the minimum length was 43.4 cm which is 54.5 cm on average (40). A study done by Baergen et al. also disagrees with the study done in the University College of Medical Science in Delhi in which the average cord length was found to be 44.3 cm ± SD 9.2 cm (48).

Another study done in OWO indicates that the average cord length was 51.5 cm ± SD 6.67 cm with range of 44.83-58.17 cm (42) which is closer to the study done by C.S. Abaidoo et al. found to be 47.04 cm cord length (49) and study done in OWO (42). Another study done by Chinese University of Hong Kong indicates that the median umbilical cord length is 55 cm (range 18–110 cm) (50) which strongly disagrees with the study done by Baergen et al. (47) and strongly agrees with the study done by Rohinidevi et al. (40).

Based on the study done by Rohinidevi et al. at Madurai Medical College, Madurai, India, the maximum transverse diameter of the cord at the fetal end was 1.4 cm and minimum was 0.7 cm. The maximum transverse diameter of the cord at the placental end was 1.7 cm and minimum was 1.2 cm (40) whereas the study done by C.S. Abaidoo et al. shows that the diameter of the umbilical cord varies from 1.5 cm-3.2 cm with mean of 2.1 cm. From the majority of the studies the cord's diameter was between 2.1 cm and 2.5 cm (49) which is highly varied from the study done by Rohinidevi et al.

Based on the study done by Rohinidevi et al. at Madurai Medical College hypo-coiling of the cord was seen in 70%, hyper coiling in 24% and straight in 6%. In hypo-coiling umbilical cord the maximum coiling index was 0.12 and minimum was 0.08. In hyper-coiling umbilical cord the maximum coiling index was 0.18 and minimum was 0.14 (40) which disagrees with the study done at the University college of Medical Sciences, Delhi, India, in which the occurrence of hyper-helical (coiled), hypo-helical (straight), twisted and spiral cords were 36%, 18%, 36% and 10% respectively (49). According to the study done by Shalu Gupta et

al. the mean number of coils was 5.8 ± 3.8, no umbilical cord coiling was seen in 6 (5.6%) cases and the mean UCI was 0.13 ± 0.08 (48).

The study done by Rohinidevi et al. indicates that false knots were seen in 32%, absence of knots in 68% and true knots were not observed. Three vessel patterns were observed in all umbilical cord specimens (40) which is different from the research done by C.S. Abaidoo et al. where umbilical cord vessels were found to be 2, 3 and 4 vessel cords (1%, 96% and 2.2% respectively).The large majority of the cords had 3 umbilical cord vessels. From total study subjects 0.8% had a single umbilical artery. About 8.64% had a furcate attachment to the placenta, whereas the remaining 91.36% were non-furcate in their modes of insertion. No velamentous umbilical cords were seen. Cord knots and cord looping knot formation was observed in about 4% of the cords. One had a true knot and the remaining four were false knots and the cords in which they were found were considerably long (49).

Based on the study done by the University College of Medical Sciences, Delhi, India, all umbilical cords had three blood vessels (48) which agrees with the study done by Rohinidevi et al. in which three vessel patterns were observed in all umbilical cord specimens (40).

As in the study done by the Chinese University of Hong Kong, of the total deliveries eligible for investigation, 66 (50%) had no nuchal cord entanglement, 33 (25%) loose and 33 (25%) had tight nuchal entanglement. All umbilical cords had two arteries and one vein. There were no significant differences between central and lateral cord insertions in terms of cord length (50). This agrees with the study in OWO, in which the majority of umbilical cords had between10 to 12 helices and most of the umbilical cords were inserted centrally on the placenta (42).

Strong et al. stated that hypo-coiled cords and non-coiled cords were seen in 4 to 5% and this had a significant correlation with birth outcome concerning meconium staining, preterm birth and fetal distress (51). Studies done in Liv Hospital, Ankara, Turkey also show that a positive, linear, and statistically significant relationship was found between the UCI scores and the umbilical cord blood transferrin saturation, umbilical cord thickness, and the one and five minute APGAR score (36). This agrees with the study done by Jumpers that reduction in

length was attributed to a deficiency of ghrelin, a potent growth factor, resulting in reduced blood flow and nutrients to the cord (37).

The reduction in the diameter as well as in the cross-sectional area has been ascribed to the reduction in the Wharton's jelly. Hyaluronic acid, the main constituent of glycosaminoglycan, is replaced by sulfated proteoglycans, thus resulting in reduced Wharton's jelly content as well as reduction of hydration in preeclampsia (38). A reduction in the volume of the jelly would, in turn, lead to altered hemodynamics that further result in compromised blood flow and intrauterine growth retardation (39).

There are also literature studies which report the relationship of the UCI with antenatal and perinatal problems (43). Shalu Gupta et al. (44) reported that low UCI was associated with adverse antenatal and perinatal complications. In the study by De Laat et al. (52) where normal and complicated pregnancies were investigated, it was demonstrated that low or high UCI increased adverse the perinatal risks. Another study indicates that hypo- and hyper-coiling was also found to be associated with several adverse antenatal and neonatal outcomes, and it was reported that UCI was a perinatal outcome predictor (53).

Another study indicates that the significance of long umbilical cords resides in the fact that they may be directly associated with poor fetal outcome and umbilical cord accidents such as fetal entanglement, knot formation (multiple) and torsion. Fetal cord entanglements in particular may reduce the volume of blood flow to the fetal brain and limbs and subsequently cause neurological disturbances (54). In contrast other researchers have reported that umbilical cord function is not impaired by long cords suggesting that venous flow from placenta to fetus is maintained regardless of the length of the umbilical cord (55).

Figure 1: Long umbilical cord (68 cm) (40)

Figure 2: Umbilical cord coiling(40)

Figure 3: False knot (40)

In contrast, relatively short cords may interfere with the mechanics of labor, as the fetus may not be able to descend because the cord length limits it (56). In such cases caesarean section, forceps and vacuum extraction would be the only choice left for safe delivery of the fetus. Cords of insufficient length may also result in breech presentation, prolonged labor, abruptio placentae and uterine inversion (57). Short cords were found in newborns with early intrauterine constraint and in those with gross structural or functional limb defects that limit intrauterine movement (58). Especially umbilical cord length is a main factor associated and documented as a definite risk factor for poor fetal outcome (55).

1.4. Rational of the Study

The purpose of this study is to investigate and to come up with a conclusion about the morphological variation of the umbilical cord and to its clinical significance on birth outcomes since this research was not done in our context before.

2. OBJECTIVE OF THE STUDY

2.1. General Objective

To study morphological variations of the umbilical cord and its clinical significance on birth outcomes.

2.2. Specific Objective

1) To describe variations of umbilical cord length.

2) To identify variations of umbilical cord coiling pattern.

3) To assess variations of umbilical cord vasculature.

3. METHODOLOGY

3.1 Study Area

The study was conducted at Korem General Hospital, Southern Tigray, Ethiopia.

3.2 Study Period

The study was conducted from October 2024 – May 2025

3.3 Study Design

Descriptive cross-sectional study design

3.4. Study Unit

All mothers who delivered during the study period and fulfilled the inclusion criteria

3.5 Sample Size to Estimate a Single Population Proportion

$$n=\frac{Z{a/_2}^2 p(1-p)}{d^2},$$

Where

- n is the minimum sample size required for very a large population (≥10,000)
- Z is the critical value for a given confidence interval
- p is the expected proportion of the event to be studied (to be estimated based on findings of previous studies)
- d is margin of error
- If p is not known it has to be taken as 50%
- 10-15% contingency should be added, because the source population is unknown (due to the national war conflict it is difficult to get the data)

n = 1.96*1.96*0.5*0.5/.05*.05

= 384.16+15%*n

= 384.16+384*15/100

n = 442 is the total sample size

3.6 Sampling Method

Purposive (Judgmental) sampling method was applied.

3.7 Methods of data collection

The data collection method was by face-to-face interview through questionnaire, measuring of the length, coiling pattern, and observation of the vasculature.

3.8 Inclusion Criteria

All mothers in labor who fulfill the criteria of data collection.

3.9 Exclusion Criteria

Mothers having known chronic diseases and had prior adverse obstetric history (tuberculosis, HIV, cancer, diabetes mellitus, rhesus negative mothers and postdate pregnancy)

3.9.1 Data Processing and Analysis

The data was entered and clearance was assured by using epidata software and analysis was done by using SPSS version 26.

4.ETHICAL CONSIDERATION

The study was conducted after an ethical clearance letter is obtained from the ethical review board of Mekelle University, College of Health Sciences. The support letter will be given to the CEO of the hospital (study area) (21) and consent and clear information was given to the mothers before each procedure. I myself carried out the study together with well-trained personnel.

5. RESULT AND DISCUSSION

This study aimed to investigate the morphological variations of umbilical cord in terms of length, coiling pattern, vascular pattern and to highlight its clinical impact on birth outcome. Data was collected by face-to-face interview, through questionnaire, observation of the vasculature and coiling pattern of the umbilical cord and by measuring the length of the umbilical cord from 442 sample of placenta and entered by using the epidata software and the data analysis technique was mean, mode, median, standard deviation, range, and frequency distribution by using SPSS version 26.

5.1 Sociodemographic

70.6% (312) the study participants were between age of 18 and 35 years old while 28.7 % (127) were greater than 35 years old and the rest0.7 % were less than 18 years old. Most of the mothers were multigravida which accounts 70% (323) and the rest 30% (119) were primigravida and the gestational age of the pregnancy was term in majority the mothers which was 90.5% (400), preterm in 7% (32) and the rest was with unknown gestational age.

Majority of the study participants were rural resident which accounts 52.7%, and the rest 47.3% were from urban, this may be duet to the rural population is higher than the urban population.50.7% of the participants were literate while rest 49.3 % were illiterate, the reason for the proportionality of the educational status may be due to most participants were from rural area. Majority of the mothers were Orthodox in religion which accounts around 89.1 % (394) followed by Muslim,9.9% (44) and the rest were protestant.

5.2 Length Variation

Table 1

Statistic	Value (cm)
Minimum Length	35
Maximum Length	78
Mode	48
Mean	50
Standard Deviation	9

The mean length of the umbilical cord of this study was found to be 50 cm which is higher than the study done by Baergen et al. which was is found to be 37 cm (47) that may be due to different population and sample size, where as it was similar with the study done in OWO ,the average cord length was 51.5 cm ± SD 6.67 cm with range of 44.83-58.17 cm (42).

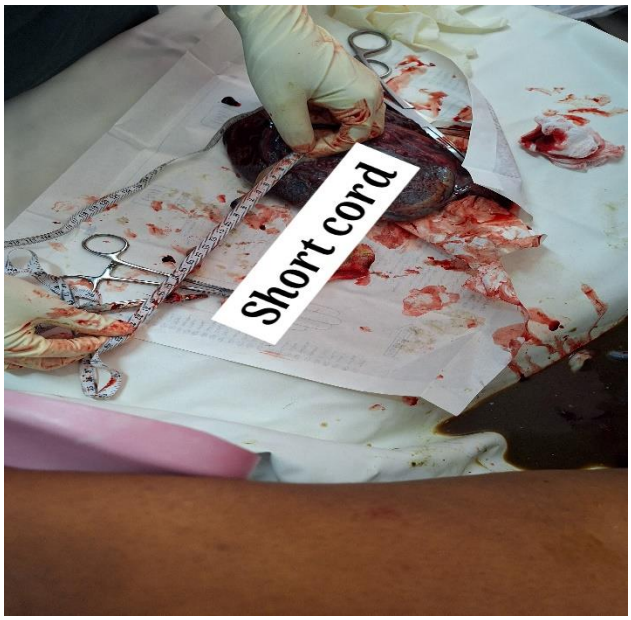
The umbilical cord of this study ranges from 35 cm to 78 cm which was relatively similar with the study done by Rohinidevi et al. shows that the maximum length was 73.4 cm and the minimum length was 43.4 cm (40).

This study is very consistence with the study done by Shunji Suzuki et al, the normal length of the umbilical cord was 45-68cm. the maximum length was greater than 74cm and minimum length was less than 34cm in Japanese singleton deliveries (46).

Other research done by C.S. Abaidoo et al. was found 47.04 cm of mean cord length which is consistence with study in India, Journal of Science and Technology (49) .The study done by Chinese University of Hong Kong indicates that range 18–110 cm) (50) which strongly disagrees with this study in which the range was 35cm-78cm ,it may be due to genetic ,evironmetal,nutritional, gestational of the pregnancy ,antenatal follow up and other factors.

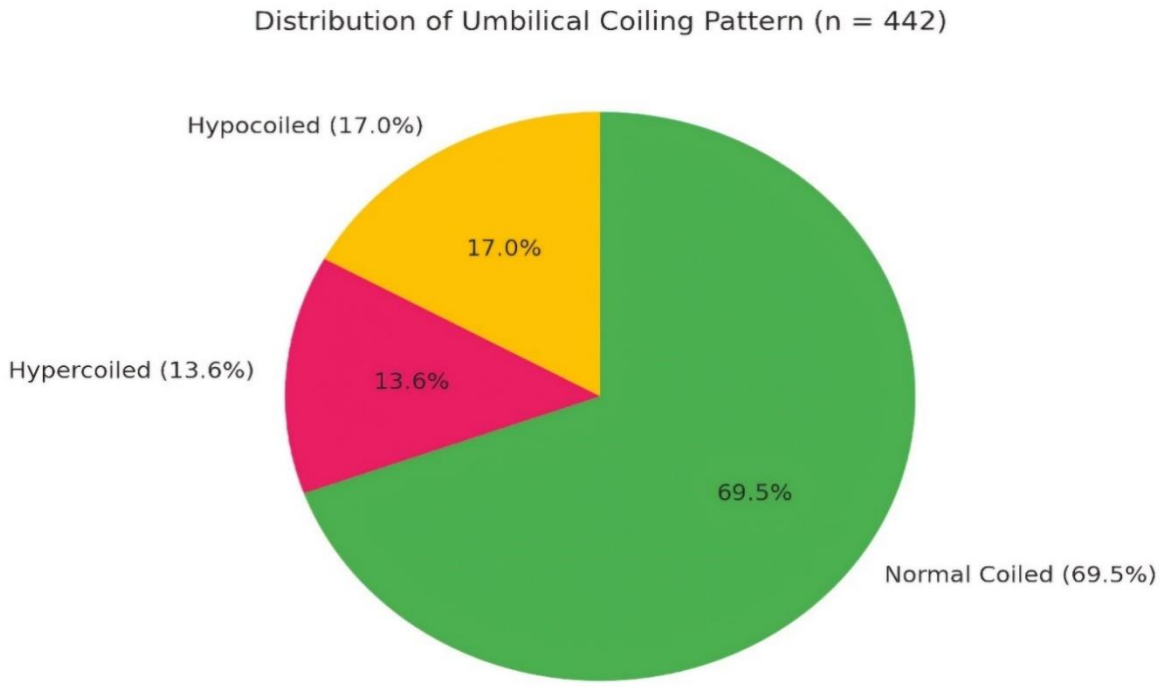
Standard deviation of is 9cm which suggests moderate variability. Approximately 68% of umbilical cords fall with in 41cm to 59 cm (mean ± SD). Around 95% of cords likely fall between 32 cm to 68 cm (mean ± 2SD) meaning the extreme values like 35cm and 78 cm are relatively uncommon but still parts of the distribution.

Figure.4 Long Umbilical cords



Figer 5. Short Umbilical cord

5.3. Coiling Pattern



The range of the coiling pattern was from 0.07 coil/cm -0.43 coil/cm as majority of umbilical cords 69.5 % (307) exhibit a normal coiling pattern. Hypo coiled (less twisting) cords was 17% (75) while hyper coiled (excessive twisting) was 13.5 % (60) which strongly disagrees with the study done by Rohinidevi et al. at Madurai Medical College hypo-coiling of the cord was seen in 70%, hyper coiling in 24% which may be due to the genetic, environmental and nutritional factors. In this study the in hypo-coiling umbilical cord the maximum coiling index was 0.09 coil/cm and the minimum was 0.07 coil/cm. In hyper-coiling umbilical cord the maximum coiling index was 0.43 and minimum was 0.15 which agrees with the study done by Rohinidevi et al. at Madurai Medical College: in hypo-coiling umbilical cord the maximum coiling index was 0.12 and minimum was 0.08. In hyper-coiling umbilical cord the maximum coiling index was 0.18 and minimum was 0.14 (40).This study also relatively agrees with the study done at the University college of Medical Sciences, Delhi, India, in which the occurrence of hyper-helical (coiled), hypo-helical (straight), normal cords were 36%, 18%, 46% respectively in which majority of the cord were hyper coiled (49), the most

possible reason for the this difference are nutritional ,genetics environmental, antenatal follow ups.

6. Normal coiling pattern

Figer 7. Hyper coiling pattern

Figure. 8 Hypo coiled umbilical cord

5.4 Vascular Pattern

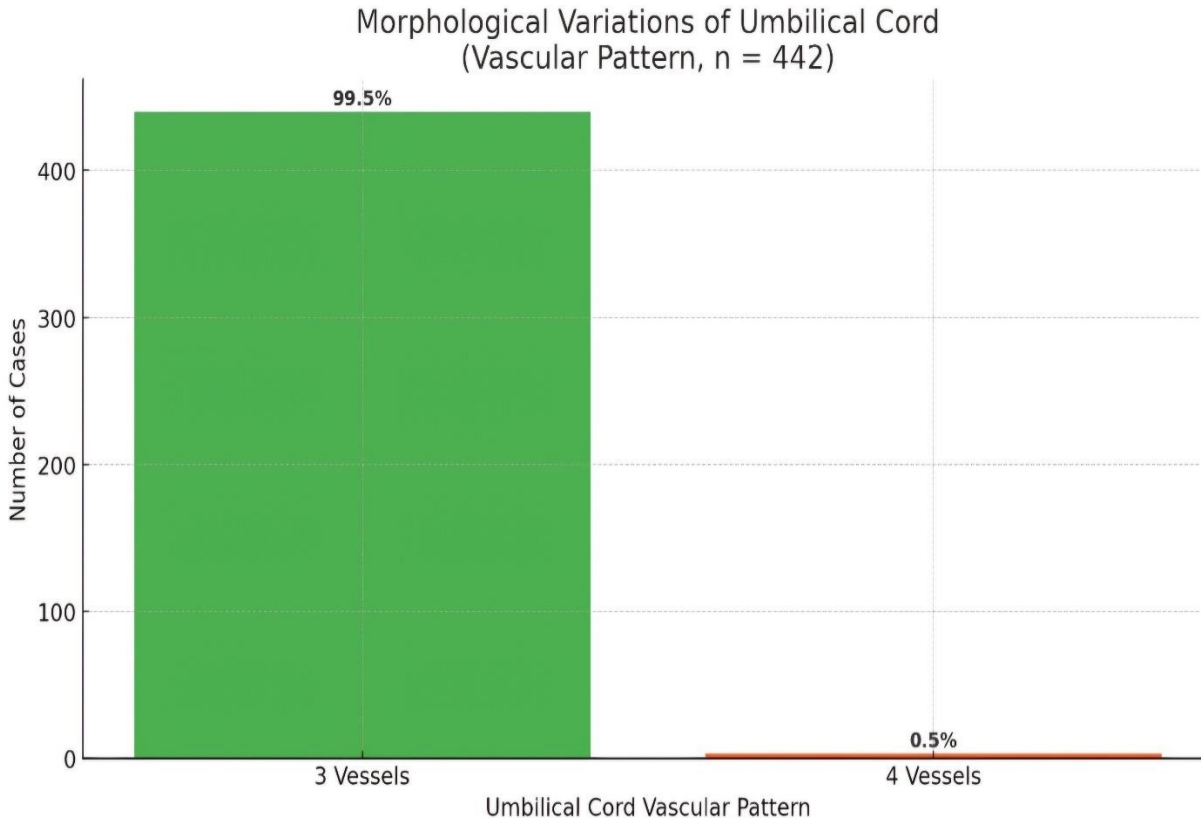


Figure 9. Four vessel umbilical cord

Majority of the umbilical cords had 3 vessels (2 arteries,1 vein) which were seen in 99.5% (440) of study participants while presence of 4 vessels was observed in 2 (0.5%) cases.

The variations are commonly associated with genetic (chromosomal, Trisomy 13,18,21) anomalies, embryological congenital anomalies, conjoined twins, persistent right umbilical vein, twin to twin transfusion, maternal factor , and placental factor (47)which were not seen in this study grossly. However, single umbilical artery cases were absent in this study which was present in the research done by Abaidoo et al where umbilical cord vessels were found to be 96% 3 vessel,1% 2 vessel and 2.2% 4 vessels (49).As majority of the umbilical cords (99.5%) of this study had three vessels, it relatively agrees with study done by the University College of Medical Sciences, Delhi, India and the study done by Rohinidevi et al. in which three vessel patterns were observed in all umbilical cord specimens (40).Majority of the study findings including this study shows three vessel vascular pattern accounts the highest number except in very rare cases.

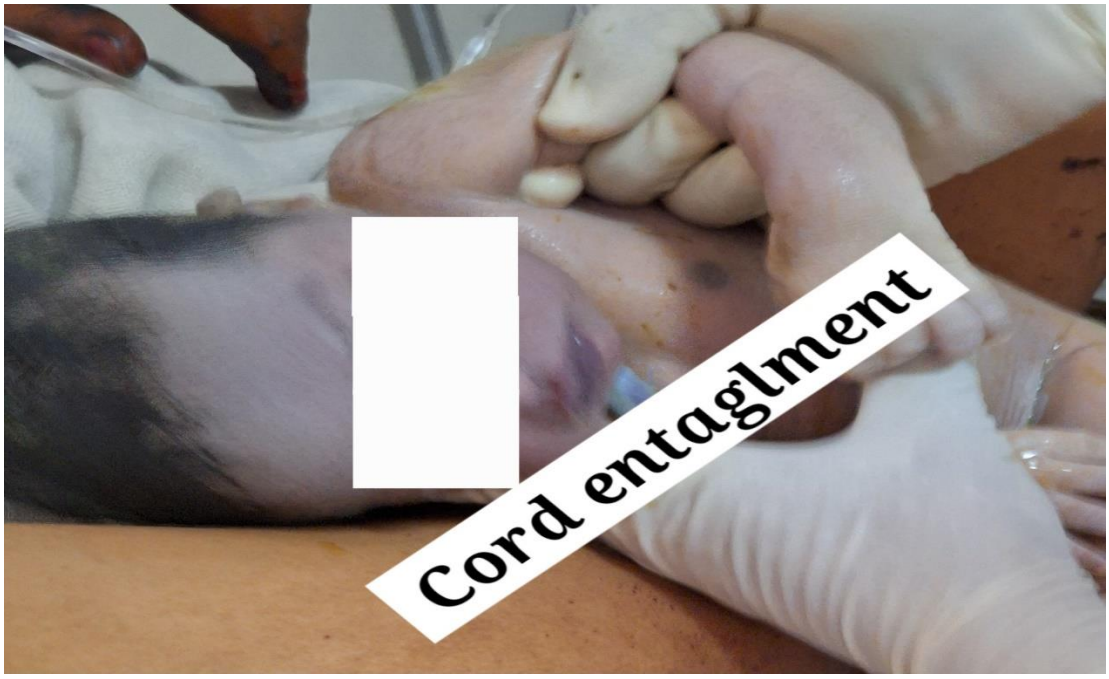


Figure 10. Cord entanglement

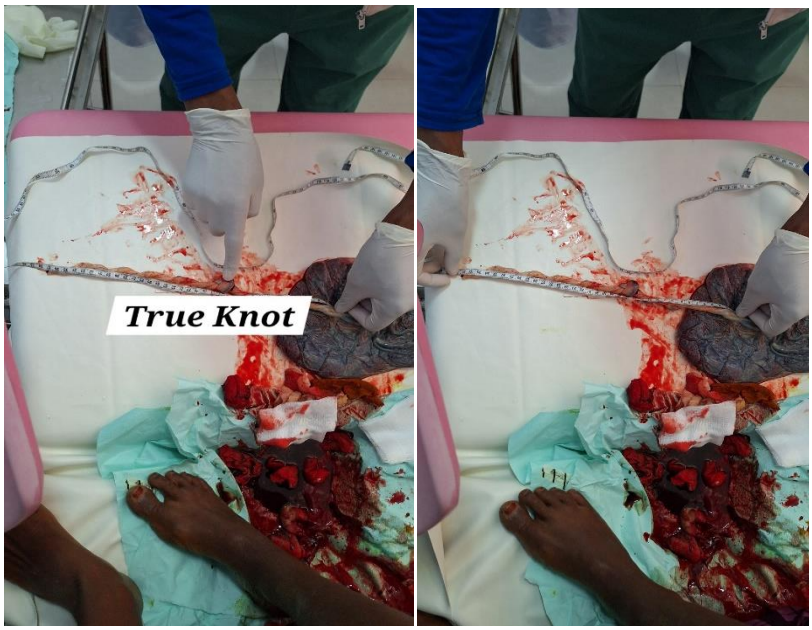


Figure 11. True Knot

Figure 12. False Knot

88% (392) the umbilical cord had not had any cord knot whereas the 8% (36) and 3.2% (14) had false and true knot respectively which is different with study done by Rohinidevi et al. indicates that false knots were seen in 32%, absence of knots in 68% and true knots were not observed, this may be due to different in sample size, population and environmental factors. In addition to this study shows 17.2% (76) newborns had cord entanglements which had an impact on birth outcome like cord compress which lead to fetal distress and death.

97.7% (432) babies had 2500 gram -4000 gram weight and 2.3 % (10) had <2500gram weight while the remaining 0.5 % had >4000-gram weight.6% (27) developed obstetric emergency such antepartum hemorrhage, postpartum hemorrhage, cord prolapse and fetal distress 3,10,4 and 10 respectively.76.2% (337) mothers were delivered by spontaneous vaginal delivery,16.7 % (74) ,7% (31) were delivered by instrumental and cesarean delivery respectively.

2.3% (10) of the total delivery was IUFD while the 0.7% (3) were still birth. 80.5% (356) normal delivery,18.8% (80) prolonged, and the remaining 1.4% (6) precipitated labour.85.3 % (377) of the amniotic fluid was clear while the rest 14% (62) and .7% (3) were meconium stained and blood stained respectively.

6. CONCLUSION

This study shows umbilical cord varies in morphology in terms of length, coiling pattern, vascular pattern, cord knot, and cord entanglement. So, this study will have an input for gross and clinical anatomy as the medical students are goining to benefit from this study. The study also shows the variations has impact on birth outcome. So, this study will strengthen for medical interventions for the health professionals specially for Surgeons, Obstetricians and Gynecologists.

7.RECOMMENDATION

The study provides important baseline data on umbilical cord morphology which may help in understanding fetal development and potential complications. Further research with a large sample size is recommended to explore the associated factors and clinical significance of those variations.

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10.ANNEXES

Questionnaire on morphological variation of the umbilical cord and its clinical significance

Name _____age ___ sex __ wereda _____ kebele _____occupation ___religion ___medical registration number ____gravida __para _____ live children _____abortions_____

1) Have you had any known chronic disease or adverse obstetric history (diabetes mellitus, hypertension, cancer, TB, and HIV? Still birth, postdate pregnancy etc.)? yes ___no ____If no, continue to the following questions

2. What is the gestational age of the pregnancy at delivery?

3. Have you had any obstetric emergency during pregnancy and delivery (bleeding, cord prolapse, fetal distress etc.? yes ___ no ____ if yes, specify_____

4. What was the color of the amniotic fluid (clear, meconium stained, blood stained)

5. APGAR score of the baby _____

6. Weight of the baby _____

7. Length of the umbilical cord _____

8. Coiling pattern of the umbilical cord _____

9. Number of umbilical vessels _____

10. Mode of delivery _____

11. Duration of second stage labor (prolonged or normal) _____

13. was there any true knot yes ___ no ____

14. was there any false knot yes ___ no ____

15. Was there entanglement yes ___ no ____