

## Determinants and Obstetrics Outcome of Umbilical Cord Prolapse At University of Calabar Teaching Hospital, Calabar, Nigeria

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**Abstract:** Umbilical cord prolapse is a serious obstetrics condition with high perinatal mortality. The objectives were to determine the prevalence, demographic characteristics, risk factors and complications of umbilical cord prolapse at UCTH Calabar. This was a six-year retrospective case-control study of patients with umbilical cord prolapse managed in our hospital from 1st January, 2008 to 31st December, 2013. Two controls per case were used. Statistical analyses was done using Epi-info version 7.

A total of 15,216 deliveries were recorded during the period of study. Out of these, 47 patients were diagnosed of cord prolapse with incidence of 0.31%. Cord prolapse was significantly higher among multiparous women (OR=0.364, CI=0.155-0.855); birth weight <2.5kg (OR=3.371, CI=1.238-9.181); multiple pregnancy (OR=0.089, CI=0.010-0.790) and unbooked pregnancy (OR=0.247, CI=0.112-0.551) than their controls. Caesarean section, low fifth minutes Apgar and perinatal mortality were significantly higher among patients with cord prolapse than their controls. Although, most of the risk factors for cord prolapse are not modifiable, antenatal booking and hospital delivery will decrease the observed complications by offering those at risk elective caesarean section and early recognition of cord prolapse, resuscitation and emergency cesarean section.

**Keywords:** Umbilical cord prolapse, complications, perinatal mortality, pregnancy, patients, caesarean section

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### I. Introduction.

Umbilical cord prolapse is an obstetrics emergency that is associated with high perinatal morbidity and mortality [1]. Cord prolapse occurs when the umbilical cord descends into the lower uterine segment where it may lie adjacent to the presenting part (occult cord prolapse) or below the presenting part (overt cord prolapse) and the foetal membranes have ruptured [1-3]. In occult cord prolapse, the umbilical cord cannot be palpated during pelvic examination, whereas in overt cord prolapse, the umbilical cord prolapse below the level of the presenting part and the cord often can be easily palpated during vaginal examination or obvious through the introitus [3]. It differs from cord presentation in which the umbilical cord descend into the lower uterine segment where it lie below the presenting part and the foetal membranes are intact. The perinatal mortality is slightly lower with cord presentation [2].

The incidence of umbilical cord prolapse as quoted in several studies varies between 0.1% and 0.6% [4]. Prevalence of 0.37% and 0.47% were reported in Nnewi and Ibadan, Nigeria [5, 6]. The prevalence has been noted to be declining in the last seven decades due to increase in use of elective caesarean section in non-cephalic presentations [7]. The incidence of occult prolapse is unknown because it cannot easily be detected but can be suspected when there are foetal heart rate abnormalities characteristics of umbilical cord compression [3, 4].

Several Obstetrics literatures showed that the major cause of cord prolapse is incomplete fitting of the presenting part into the maternal pelvis at the time of membrane rupture [3-6]. These risk factors include foetal mal-presentation, low birth weight, multiparity, prematurity, contracted pelvis, pelvic tumours, low lying placenta, polyhydramnios, premature rupture of membranes and multiple pregnancy [3-6]. The incidence of overt umbilical cord prolapse in cephalic presentation at term is 0.5%, frank breech 0.5%, complete breech 5%, footling breech 15% and transverse lie 20% [3]. Remarkably high correlation of cord prolapse and obstetric interventions such as foetal scalp electrode application, insertion of intrauterine catheter, induction of labour with artificial rupture of membranes (ARM) is reported [8]. Most of the risk factors are largely unavoidable [1, 3, 4].

Prolapse of the umbilical cord exposes the cord to intermittent or persistent compression between the presenting part and the pelvic bone, cervix or vaginal canal. Compression of the umbilical cord compromises

foetal circulation and depending on the duration and intensity of compression, may lead to foetal hypoxia, brain damage and death. In overt cord prolapse, exposure of the umbilical cord to air causes irritation and cooling of the cord, resulting in further vasospasm of the cord vessels and reduction in cord blood flow. The duration of umbilical cord exposure determines the prognosis; exposure of the umbilical cord for more than 10 minutes gives a poor outcome [9]. The first clinical manifestation of cord prolapse is usually a severe, prolonged foetal bradycardia or moderate variable deceleration after a previously normal tracing [10,11].

Cord prolapse is associated with maternal morbidity, high perinatal morbidity and mortality. Perinatal mortality and morbidity has fallen significantly as a result of advances in management of cord prolapse and NICU care [8]. Maternal complications include those related to anaesthesia, haemorrhage and infection following caesarean section or operative vaginal delivery.

The foetus whose wellbeing is jeopardized by umbilical cord compression shows variable foetal heart rate deceleration during uterine contractions, with prompt return of the foetal heart rate to normal as each contraction subsides. If cord compression is complete and prolonged, foetal bradycardia occurs. Persistent, severe variable deceleration and bradycardia leads to development of hypoxia, metabolic acidosis, and eventual damage or death [1,3,4]. Death may be preceded by reduced or absence foetal movement. With the introduction and use of electronics foetal heart rate monitoring in recent years, variable deceleration pattern have been associated with umbilical cord prolapse and has aided early intrapartum intervention [9,12]. In contrast to developed countries, many obstetric units in developing countries lack this continuous foetal monitoring facilities and it is not usually easy to mobilize the theatre for emergency caesarean section. In addition, most patients with cord prolapse travel long distance to access hospitals with emergency caesarean section facilities. All these contribute to high perinatal mortality associated with cord prolapse [3]. Diagnosis to Delivery Interval (DDI) of 20-30 minutes has been recommended by various international obstetric societies to reduce the perinatal morbidity and mortality [13, 14].

The optimal management is prompt delivery to avoid foetal death from cord compression. However, caesarean section is often the fastest approach for a viable foetus unless vaginal delivery is imminent. If the cervix is fully dilated and presentation is cephalic, assisted vaginal delivery using a vacuum or forceps can be done. If the foetus is dead, cord prolapse may be ignored and vaginal delivery should be aimed at except if there is mechanical problem such as inadequate maternal pelvis, malposition or malpresentation [3, 4]. While preparation for the surgery is being made it is imperative to commence on certain conservative measures that prevent further compression of the cord. Various resuscitative measures such as, giving oxygen to the mother, manual elevation of the presenting part above the pelvic brim, inflating the bladder with 500-600mls of normal saline with the aim of inhibiting uterine contractions and elevating the presenting part have been applied following diagnosis, while preparing for emergency delivery in a live foetus [3, 4, 10]. These actions singly or in combination will raise the presenting part off the cord and reduce the uterine activities.

Umbilical cord prolapse is a major cause of perinatal mortality. An audit of umbilical cord prolapse is important to find out the predisposing factors to this contributor to perinatal mortality in our environment. This study is therefore, aimed to determine the prevalence, demographic characteristics, risk factors and complications of umbilical cord prolapse and to find ways to improve on its outcome.

## **II. Materials And Methods**

This was a cross sectional case control study carried out to review all cases of umbilical cord prolapse managed at University of Calabar Teaching Hospital between 1st January, 2008 and 31st of December, 2013. Two controls per case were selected from the birth records by selecting the delivery just before and after the umbilical cord prolapse in the birth register. The sources of the data were the labour ward birth records, theatre operation register and patient case files. Information obtained from the records were age, parity, gestational age, booking status and mode of delivery. Data were also collected on the number of foetuses (singleton or multiple), foetal presentation, Apgar score at the first and fifth minutes, birth weight and maternal complications. The conditions of the babies till one week of admission in the SCBU and at discharge were also obtained. In cases of twin pregnancy, only the parameter on the foetus with a prolapsed cord was included in the study. Of the 47 cases of umbilical cord prolapse recorded over the study period, 42 case files were available and formed the bases for analysis. Umbilical cord prolapse was defined as the palpation/presence of the umbilical cord below the presenting part following rupture of the membranes. Unbooked pregnancy was defined as a pregnant woman who has not attended any antenatal clinic session throughout the pregnancy with a skilled attendant (trained medical personnel) before presentation in labour [15]. Booked pregnant woman is one who attended at least one antenatal clinic section during pregnancy by trained personnel [15]. Statistical analysis was done using Epi-info version 7 software. The odds ratios were calculated and a P value of <0.05 was considered significant at 95% confidence interval (CI).

### III. Results

There were 15,216 deliveries at the University of Calabar Teaching Hospital over the study period and 47 cases of Umbilical cord prolapse were recorded giving an incidence of 0.31% of total delivery or 1 in 324 deliveries. The mean age of patients with cord prolapse was  $28.4 \pm 7.9$  years while the mean parity was  $3.34 \pm 2.6$ .

**TABLE 1: Demographic characteristics of patients with umbilical cord prolapse**

Characteristics	Case (42)	Control (84)	OR	95%CI	P-value
	No (%)	No (%)			
<b>Age</b>					
≤20	4 (9.5)	9 (10.7)	1.157	0.548 - 2.44	0.975
21-30	19 (45.2)	40 (47.6)			
31-40	17 (40.5)	32 (38.1)			
>40	2 (4.8)	3 (3.6)			
<b>Parity</b>					
0	9(21.4)	36(42.9)	0.364	0.155-0.855	0.018
≥1	33(78.6)	48(57.1)			
<b>Booking status</b>					
Booked	20(47.6)	66(78.6)	0.248	0.112-0.551	0.000
Unbooked	22(52.4)	18(21.4)			

OR= Odds ratio, CI= Confidence interval

Table 1 shows the age, parity and booking status of patients with umbilical cord prolapse. The ages of the study group ranged from 15 to 45 years. Patients in the age range of 21- 30 years had the highest incidence of cord prolapse (45.2%). However, maternal age was not significantly associated with umbilical cord prolapse ( $p = 0.975$ ). Cord prolapse was significantly higher among multiparous and unbooked women (OR=0.364, CI-0.155-0.855) and (OR=0.247, CI-0.112-0.551) respectively than their control groups.

**TABLE 2: Perinatal characteristics and risk factors for umbilical cord prolapse**

Characteristics	Case (42)	Control (84)	OR	95%CI	P-value
	No (%)	No (%)			
<b>Presentation</b>					
Cephalic	23(54.8)	81(96.4)	22.3	6.062 - 82.07	0.000
Breech	11(26.2)	2(2.4)			
Transverse	8(19.0)	1(1.2)			
<b>Number of foetuses</b>					
Single	37 (88.1)	83 (98.8)	0.089	0.010-0.790	0.008
Multiple	5 (11.9)	1 (1.2)			
<b>Birth weight</b>					
<2.5kg	11 (26.2)	8 (9.5)	3.371	1.238-9.181	0.014
≥2.5kg	31 (73.8)	76 (90.5)			
<b>Gestational age</b>					
<37 weeks	12 (28.6)	13(15.5)	2.185	0.894-5.337	0.082
>37 weeks	30 (71.4)	71(84.5)			
<b>Foetal sex</b>	(5 twins)	(1 twin)			
Male	22(46.8)	46(54.1)	0.746	0.365-1.524	0.421
Female	25(53.2)	39(45.9)			

OR= Odds ratio, CI= Confidence interval

Perinatal characteristics and risk factors for umbilical cord prolapse are shown in Table 2. A total of 54.8% of all cases of umbilical cord prolapse presented cephalic while 96.4% of the control group presented cephalic. Umbilical cord prolapse occurred more in breech presentation (26.2%) and in transverse lie (19.0%) than their control groups (2.4% and 1.2% respectively) (OR=22.3, C I =6.062 - 82.07). Breech presentation and transverse lie was significantly higher among patients with cord prolapse than control, while cephalic presentation was significantly lower among patients with cord prolapse than the control. Singleton pregnancies were 88.1% among cases of cord prolapse compared to the control with 98.8%. Multiple pregnancy and birth weight less than 2.5 kg were significantly higher among patients with cord prolapse than the control (OR=0.089, C I =0.010-0.790) and (OR=3.371, C I =1.238-9.181) respectively.

**Table 3: Obstetrics outcome of umbilical cord prolapse**

Characteristics	Case (42)	Control (84)	OR	95% CI	P-value
	No (%)	No (%)			
<b>Mode of delivery</b>					
Caesarean section	32 (76.2)	14 (16.7)	16.000	6.421-39.867	0.000
Vaginal delivery	10 (23.8)	70 (83.3)			
<b>PPH</b>					
Present	11 (28.6)	10 (11.9)	2.626	1.011-6.814	0.043
Absent	31 (73.8)	74 (88.1)			
<b>1st minutes Apgar score</b>					
<8	34 (81.0)	20 (23.8)	13.600	5.423-34.106	0.000
>8	8 (19.0)	64 (66.2)			
<b>5th minutes Apgar score</b>					
<8	26 (61.9)	8 (9.5)	15.438	5.920-40.255	0.000
>8	16 (38.1)	76 (90.5)			
<b>Perinatal death</b>					
Yes	17 (40.5)	3 (3.6)	18.360	4.970-67.825	0.000
No	25 (59.5)	81 (96.4)			

OR= Odds ratio, CI= Confidence interval

PPH= Primary postpartum haemorrhage

Table 3 shows the complications of umbilical cord prolapse. Primary post partum haemorrhage was seen in 28.6% of cases of umbilical cord prolapse compared to 11.9% of post partum haemorrhage observed in the control group. The difference was statistically significance (OR=2.626, C I=1.0112-6.814). There was no case of maternal death in both the study group and control. There were 17 (40.5%) cases of perinatal death among patients with cord prolapse, compared to 3(3.6%) in the control group. The perinatal mortality rate for cases of cord prolapse was 405/1000 compared to 36/1000 for the control group, which was significantly significant (OR=18.360, C I=4.970-67.825). Low 5th minutes Apgar score less than 8 and caesarean section were significantly higher among patients with cord prolapse compared to their control groups (OR=15.438, C I =5.920-40.255) and (OR=16.00, C I =6.421-39.867) respectively.

#### IV. Discussion

Cord prolapse is an Obstetric event that can suddenly transform pregnancy without previous complication labeled low risk pregnancy to a tragic emergency and outcome. This condition is associated with high foetal morbidity and mortality and increases maternal risk during delivery [3,4]

The incidence of umbilical cord prolapse of 0.31% in this study is comparable to 0.37% and 0.47% reported in Nnewi and Ibadan, Nigeria [5,6]. This may be due to similar high rate of unbooked pregnancy in developing countries and because the studies were carried out in the tertiary centres which are referral centres. But this incidence is however slightly higher than the incidence of 0.2% recorded in the United Kingdom [16]. The lower rate observed in United Kingdom may be due to the fact that most pregnancies are booked with identification of at risk group during antenatal period for proper care. It is therefore necessary that the obstetrician recognizes the risk factors of umbilical cord prolapse in antenatal clients in the course of the pregnancy for surveillance.

Multiparity have been associated with umbilical cord prolapse in previous studies [5,6] and this is similar to the finding in this study where a significant association was found between multiparity and umbilical cord prolapse. Previous studies have examined various risk factors related to umbilical cord prolapse. Foetal malpresentation is well known to be associated with an increased risk of umbilical cord prolapse [1, 3, 17]. The findings were similar to the result obtained in this study. In this study, breech accounted for 26.2% and the ratio in the control group was 2.4% and the difference was statistically significant. Transverse lie was significantly associated with increased risk of cord prolapse and accounted for 19.0% of cord prolapse, while in the control group, transverse lie accounted for 1.2%. This study therefore shows that abnormal foetal presentation and lie are consistent risk factors of umbilical cord prolapse.

There was significant correlation between low birth weights less than 2.5kg and risk of cord prolapse in this study as 26.2% of the study group had birth weight less than 2.5 kg compared with 9.5% of the control group. Though gestational age was not significantly associated with cord prolapse in this study, but since a significant number of preterm pregnancies will have low birth weights, prematurity itself, may be a contributor to the incidence of umbilical cord prolapsed. Multiple pregnancy is another risk factor noted in previous studies [5]. This study also confirmed a significant association between umbilical cord prolapse and multiple pregnancy. Among the cases with umbilical prolapse 11.9% were multiple pregnancies compared to 1.2% in the control group.

Emergency caesarean was the commonest mode of delivery among patients with cord prolapse in this study accounting for 76.2% compare to 16.7%) in the control. All the patients who presented with cord prolapse and live foetus had emergency caesarean section. The finding is similar to some studies in Nigeria [5, 6].

This study recorded a significant association between umbilical cord prolapse and unbooked status. A total of 52.4% of the patients with cord prolapse were unbooked pregnancies compared to 21.4% of unbooked status in the control group. This may be the reason for high perinatal mortality observed in this study where 12 out of the 17 perinatal mortalities recorded were unbooked pregnancies. Antenatal booking and attendance will help in early identification of risk factors such as breech presentation, transverse lie and multiple pregnancy for appropriate care and decrease the observed complications

The Perinatal mortality recorded in this study is 40.5%, accounting for a perinatal mortality rate for cord prolapse of 405/1000 deliveries. Of the 17 perinatal mortalities, 13 were already dead before presentation in the hospital while 4 fetuses died after presentation and in early neonatal period. This is very high and reflect high rate of unbooked pregnancy and late presentation to the Hospital. This is similar to the perinatal mortality of 40.3% and 41.3% recorded in Ibadan and Abakaliki, Nigeria [6, 10]. This study show a similar trend of perinatal mortality associated with umbilical cord prolapse. This comparative high mortality in these studies may be explained by the large number of unbooked cases recorded in this study which constituted majority of the perinatal mortality cases. It is also noted that most of the booked pregnancies that had cord prolapse while on admission for labour had emergency caesarean section with good perinatal outcome.

## V. Conclusion And Recommendation

This study has shown that abnormal presentation, low birth weight, multiple pregnancy, multiparity and unbooked pregnancy are significantly associated with increased risk of umbilical cord prolapse. Unbooked status is an important modifiable risk factor for both umbilical cord prolapse and perinatal mortality. Although, most risk factors of umbilical cord prolapse observed in this study such as abnormal foetal lie, abnormal presentation, low birth weight, multiple pregnancy can be considered unavoidable, they should serve as markers to identify patients at risk of umbilical prolapse. It is important that the obstetrician identify these risk factors in individual patients in the course of the pregnancy. To ensure a good perinatal outcome following umbilical cord prolapse, antenatal booking and hospital delivery are very important factors. Antenatal booking and hospital delivery will decrease the risk and complications of umbilical cord prolapse by either correcting the presentation at term or obviating labour by offering elective caesarean section. Also, if umbilical cord prolapse occurs in the hospital during labour, the perinatal outcome is more likely to be better than those with cord prolapse outside the hospital. Therefore, when cord prolapse occurs, early recognition, resuscitation and emergency delivery will help reduce perinatal morbidity and mortality.

## Conflicts of Interest

The authors have no conflict of interest in performing the research and have not received fund from any organization.

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