

# Risk factors and perinatal outcome of umbilical cord prolapse in Ebonyi State University Teaching Hospital, Abakaliki, Nigeria

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## Abstract

**Aim:** The goal of this study was to identify risk factors associated with umbilical cord prolapse and to document the perinatal outcome of cases of cord prolapse.

**Materials and Methods:** During the period of the study (from July 1, 2001 and June 30, 2007), forty-six cases of umbilical cord prolapse were identified from the labor ward record and analyzed retrospectively. Associations between cord prolapse and potential risk factors were evaluated by means of the odds ratio.

**Results:** During the period of the study, 46 cases of cord prolapse were encountered out of 10,080 deliveries which was 0.46% of all deliveries. Of the 46 fetuses with umbilical cord prolapse 32.6% had a fetal weight of less than 2.5 kg compared with 15.2% for fetuses in control group ( $P < 0.012$ ). The umbilical cord prolapse occurred in association with breech presentation eleven times (23.9%) and transverse presentation seven times (15.2%). The occurrence of breech presentation among the control cases was 4.3% ( $P < 0.00031$ ), and that of transverse lie was 4.4% ( $P < 0.02007$ ). Among the women that had cord prolapse, 47.8% had unbooked pregnancies compared with the control group with 14.5% ( $P < 0.0000033$ ). Multiparity accounted for 78.3% in the cord prolapse cases and 68.1% in the controls ( $P = 0.19$ ). The perinatal mortality rate was 413/1000. (41.3%), compared to the perinatal mortality of 58/1000 for the control group.

**Conclusions:** Our findings in this study has confirmed an association between increased risk of umbilical cord prolapse and abnormal fetal presentation, low birth weight and unbooked status. It is therefore suggested that pregnant women should be encouraged to register early in pregnancy for antenatal care and this will enhance the early identification of these risk factors and an appropriate management instituted to reduce perinatal mortality.

**Key words:** Nigeria, perinatal outcome, risk factors, umbilical prolapse

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## Introduction

Umbilical cord prolapse is an obstetric emergency that endangers the life and well being of the fetus and increases maternal morbidity. Cord prolapse is a clinical condition which describes the presence of the fetal umbilical cord below the presenting part when the membrane has ruptured. It is overt if the cord is seen within the cervix or in the vagina, where as occult cord prolapse is when it is compressed between the uterine wall and the fetal part.<sup>[1-3]</sup> Cord presentation on the other hand is the presence of the umbilical cord below the presenting part with intact

membranes.<sup>[3]</sup> The incidence of umbilical cord prolapse as quoted in several studies varies between 0.14% and 0.62%<sup>[1,4-6]</sup> The incidence has been noted to be declining in the last seven decades due to increase in the safety and use of elective caesarean section in noncephalic presentations and more active intrapartum management of preterm pregnancies.<sup>[4,7]</sup>

Several pieces of obstetric literature showed that the major

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cause of cord prolapse is incomplete fitting of the presenting part into the maternal pelvis at the time of membrane rupture. These risk factors include fetal malpresentation, low birth weight, multiparity, preterm delivery, contracted pelvis, and multiple pregnancy.<sup>[8,9]</sup> Most of the risk factors are largely unavoidable.<sup>[1]</sup> Cord prolapse is associated with high perinatal mortality, as high as 375 per 1000 was recorded in 1924<sup>[10]</sup> but in the past few decades the perinatal mortality has fallen to between 36 and 162 per 1000<sup>[8,11,12]</sup> Collae J V reported a perinatal mortality of 20% of all overt cord prolapse in his study.<sup>[13]</sup>

Current studies show that most perinatal mortality associated with cord prolapse relate more to complications of prematurity and low birth weight than to intrapartum asphyxia.<sup>[12]</sup> With the introduction and use of electronic fetal heart rate monitoring in recent years, variable deceleration pattern have been associated with umbilical cord prolapse and partial occlusion.<sup>[8,12]</sup> which has aided early intrapartum intervention. In contrast many obstetric units in developing countries lack this continuous fetal monitoring facilities and it is not very easy to mobilize the theatre for emergency caesarean section. In addition most patients with cord prolapse travel long distances to access hospitals with emergency caesarean section facilities. These result in high perinatal mortality associated with cord prolapse.<sup>[3]</sup>

Successful management of umbilical prolapse is predicated on prompt diagnosis and decisive intervention to enhance fetal survival. Various methods of manual and positional elevation of the presenting part above the pelvic brim have been applied following diagnosis and while preparing for delivery. In the absence of any contraindication to vaginal delivery, immediate delivery by vacuum extraction or obstetric forceps is advised in the presence of full cervical dilatation and a live fetus. Immediate emergency caesarean section is performed in cases of cord prolapse with partial cervical dilatation and a live fetus at a viable gestational age.<sup>[1]</sup>

Umbilical cord prolapse is a major cause of perinatal mortality<sup>[3]</sup> and no such study has been done recently in this locality to ascertain the incidence and perinatal outcome, hence the need for this study. This is descriptive study of all umbilical cord prolapse cases managed in Ebonyi State University Teaching Hospital over a 6-year period, to determine the incidence, risk factors and the perinatal outcome of cord prolapse.

## Materials and Methods

All cases of umbilical cord prolapse managed in Ebonyi State University Teaching Hospital between July 1, 2001 and June 30, 2007 were reviewed retrospectively. There were 46 cases of umbilical cord prolapse during the 6-year study period. Three controls per case were randomly selected

from the remaining births by selecting the case just before and the case just after the cord prolapse from the birth records and the third control case was selected from the first recorded case of each page of the birth record. A total of 138 controls were used in the study. The source of the data was the labor ward birth record which reviewed the parity, gestational age, booking status, and route of delivery. Data were also collected on the number of fetuses (singleton or multiple), fetal presentation, Apgar score at the first and fifth minutes, whether or not the neonate survived and the birth weight. The study was approved by the hospital research ethics committee.

Umbilical cord prolapse was defined as the palpation of the umbilical cord below the presenting part following rupture of the membranes. Fetuses that had congenital abnormality diagnosed in utero or after delivery were excluded from the study. For all cases of cord prolapse that had live fetuses on admission, manual elevation of the presenting part and head-down position of the patient were adopted as they were being transferred to the theatre or delivery suite for immediate delivery. Emergency caesarean section was done for the majority of the cases in this study. The odds ratios were calculated to identify the relationship between cord prolapse and some of the potential risk factors. And the adjusted (corrected) odds ratios were calculated using the Mantel-Haenszel method, and a *P* value of 0.05 was considered as significant at 95% confidence interval.

## Results

There were 46 cases of umbilical cord prolapse managed in Ebonyi State University Teaching Hospital during the 6-year period review by this study. The total deliveries over this same period were 10,080 and the incidence of umbilical cord prolapse was 1 in 219 births (0.46%). During the study period the caesarean section rate was 15.28% (1540 cases) and cord prolapse constituted 2.53% (39 cases) of all the caesarean sections. A total of 84.8% of all cases of umbilical cord prolapse were delivered by caesarean section while 20.3% (28) of the controls had caesarean section. Only 10.9% (5) of the cases of umbilical prolapse were delivered vaginally and these fetuses were already dead before admission in the hospital. Of the two cases that were delivered by vacuum extraction, 1 was dead before arrival in the hospital and the second one had immediate neonatal death.

Of the 46 cases of umbilical cord prolapse, 78.3% (36) were multiparous women compared to 68.1% (94) of the control group that were multiparous women (*P* = 0.19). A total of 60.9% of all cases of umbilical cord prolapse presented cephalic while 91.3% (126) of the control group presented cephalic (odds ratio = 0.13, CI = 0.06-0.37). Umbilical cord prolapse occurred in 23.9% (11) of breech presentation and 15.2% (7) of transverse presentation. The occurrence of

breech in the control group was 4.3% (6) and transverse lie was 4.4% (6). (OR=6.91, CI=2.17-22.85 and OR=3.95, CI=1.11-14.26, respectively).

Unbooked cases constituted 47.8% (22) of cases of cord prolapse while in the control group the unbooked were 14.5% (20) (OR=5.41, CI=2.40-12.26). Among the 46 cases of umbilical cord prolapse 23.9% (11) were multiple pregnancy compared to 4.3% (6) of multiple pregnancy among the control group (OR=6.91, CI= 2.17-22.85). Of the 46 fetuses with umbilical cord prolapse 32.6% (15) had birth weight of less than 2.5 kg, compared with 15.2% (21) for fetuses in the control group (OR=2.7, CI= 1.16-6.25). The difference was statistically significant. The odds ratios measuring the association between the parity, booking status, presentation, number of fetuses, the birth weight and umbilical cord prolapse are shown in Tables 1 and 2.

Apgar scores were used to assess the neonates who were delivered alive. Of the 46 cases of umbilical cord prolapse that were admitted, 42 (91.3%) fetuses had an Apgar score of less than 8 in the first minute compared to 44 (31.9%) of the control group (P<0.001). The Apgar score at the fifth minute showed that the cases of umbilical prolapse with Apgar score of less than 8 were 28 (60.9%) compared to 18 (13.0%) in the control group (P<0.001). Only one fetus that had a low Apgar score had early neonatal death following vacuum extraction, and the remaining 27 neonates were discharged in good condition.

There were 19 (41.3%) cases of perinatal death among the cases with umbilical cord prolapse compared to 8 (5.8%) cases of perinatal death in the control group (P=<0.001). The perinatal mortality rate for cases of cord prolapse was 413/1000 compared to 58/1000 for the control group. Of the 19 perinatal mortalities that occurred among the cases of umbilical cord prolapse, 13 were unbooked pregnancies, 6

cases were booked. Also of all the 19 cases of perinatal deaths, 14 of these fetuses were already dead before admission in the hospital while 5 fetuses died after arrival in the hospital. Table 3 shows the perinatal outcome of the study.

### Discussion

Normal pregnancy assigned to be relatively low risk can instantly transform into a catastrophic emergency as a result of umbilical cord prolapse. This condition is associated with high fetal morbidity and mortality and increases maternal risk significantly during delivery.<sup>[6]</sup> Early diagnosis and prompt delivery usually results in satisfactory outcome. It is therefore important that the obstetrician identify the risk factors of umbilical cord prolapse in individual patients in the course of the pregnancy.

The incidences of umbilical cord prolapse in some previous studies have been reported to be between 0.14% and 0.62%.<sup>[1,5,6,8,12,14]</sup> The incidence in this study is 0.46% and is in agreement with those earlier studies. But this incidence is however higher than the incidence of 0.2% recorded by Murphy and Mackenzie in the United Kingdom<sup>[12]</sup> but agrees with the incidence of 0.47% recorded by Enekpene *et al.* in Ibadan in 2006.<sup>[5]</sup>

Previous studies have examined various risk factors related to umbilical cord prolapse. Fetal malpresentation has variously been noted by some studies as a common risk factor for umbilical cord prolapse.<sup>[1,6,8]</sup> In a similar study done by Dilbaz *et al.* in Ankara, Turkey breech presentation accounted for 7.5% of umbilical cord prolapse, but the control group accounted for 1.0%.<sup>[11]</sup> In our study, however, while breech accounted for 23.9% among the study group and breech among the control group is 4.3%. Transverse presentation in this study accounted for 15.2% of cord prolapse, while in the

**Table 1: Association of maternal risk factors with umbilical cord prolapse**

Maternal risk factor	Study group N=46		Control group N=138		OR	95% CI
	n	%	n	%		
Age						
19 and below	5	10.9	12	8.7	1.25	0.45-3.47
20-24	7	15.2	33	23.9	0.56	0.26-1.21
25-29	10	21.7	57	41.3	0.35	0.18-0.69
30-34	17	37.0	25	18.1	2.68	1.33-5.42
35-39	6	13.0	8	5.8	2.34	0.78-7.27
40 and above	1	2.2	3	2.2	1.00	0.10-10.16
Parity						
Nulliparas	10	21.7	44	31.9	0.59	0.25-1.38
Multiparous	36	78.3	94	68.1	1.69	0.72-4.00
Booking status						
Booked	24	52.2	118	85.5	0.18	0.08-0.42
Unbooked	22	47.8	20	14.5	5.41	2.40-12.26

OR= Odds ratio, CI= Confidence interval

**Table 2: Association of some fetal characteristics with umbilical cord prolapse**

Fetal risk factors	Study group N = 46		Control group N = 138		OR	95% CI
	n	%	n	%		
Gestational age						
Less than 36 weeks	10	21.7	13	9.4	2.85	1.16-7.14
36 weeks and above	36	78.3	125	90.6	0.35	0.14-0.86
Presentation						
Cephalic	28	60.9	126	91.3	0.15	0.06-0.36
Breech	11	23.9	6	4.3	6.91	2.17-22.85
Transverse	7	15.2	6	4.4	3.95	1.11-14.26
Number of fetuses						
Singleton	35	76.1	132	95.7	0.14	0.04-0.46
Multiple	11	23.9	6	4.3	6.91	2.17-22.85
Birth weight (kg)						
< 2.5	15	32.6	21	15.2	2.70	1.16-6.25
> 2.5	31	67.4	117	84.8	0.37	0.16-0.86

OR= Odds ratio, CI= Confidence interval

**Table 3: Perinatal outcome of cases of umbilical cord prolapse compared with controls**

Perinatal outcome	Study group		Controls		P value
	n	%	n	%	
Perinatal death	19	41.3	8	5.8	P<0.001
Apgar score at 1 minute	42	91.3	44	31.9	P<0.001
Apgar score at 5 minutes	28	60.9	18	13.0	P<0.001

control group, transverse presentation accounted for 4.4%. This study therefore confirms abnormal fetal presentation as a risk factor of umbilical prolapse as well.

The association between low birth weight and umbilical cord prolapse has been confirmed by various studies in the past.<sup>[1,2,14]</sup> Dilbaz *et al.*<sup>[1]</sup> found that babies weighing less than 2.5 kg were 5 times more likely to have cord prolapse than the control group; Uygur *et al.*<sup>[6]</sup> did not show similar association with umbilical cord prolapse. In this study, 15.2% of the controls had birth weight of less than 2.5 kg compared with 32.6% of the cases with umbilical cord prolapsed (P value= 2.70, CI= 1.16-6.25). This study also confirms a positive association between birth weights less than 2.5 kg and umbilical cord prolapse.

Multiple pregnancy is another risk factor noted in previous studies.<sup>[8,15]</sup> This study confirmed a significant association between umbilical cord prolapse and multiple pregnancies. Among the cases with umbilical prolapse 23.9% were multiple pregnancies compared to 4.3% in the control group (OR=6.91, CI= 2.17-22.85). No previous study has investigated the association of unbooked status with cord prolapse in the past; however this study recorded a significant association between umbilical cord prolapse and unbooked status. A total of 47.8% of the study group were unbooked pregnancies compared to 14.5% of unbooked status in the control group (OR=5.41, CI= 2.40-12.26). This explained the findings that out of the 19 perinatal

mortalities recorded in this series, 13 were unbooked pregnancies and the fetuses were dead before arrival in the hospital.

Multiparity has been associated with umbilical prolapse in previous studies;<sup>[1,2,8,16]</sup> this was however not confirmed in this study as no significant association was found between multiparity and umbilical cord prolapse. Among the cases of cord prolapse 78.3% were multiparous women compared to 68.1% in the control group (OR=1.69, CI=0.72-4.00). This study has confirmed that abnormal presentation, low birth weight, multiple pregnancy are significant risk factors and has also shown unbooked status as an important risk factor for both umbilical cord prolapse and perinatal mortality associated with cord prolapse. In general these previously noted risk factors and complications of pregnancy can be considered unavoidable and as such their occurrence can serve as markers to identify patients at risk of umbilical cord prolapse. But unbooked status is an avoidable association to umbilical cord prolapse that should not be a major cause of perinatal mortality if early booking is encouraged.

The Perinatal mortality recorded in this study is 41.3%, accounting for a perinatal mortality rate for cord prolapse of 413/1000. Various uncorrected perinatal mortality recorded in previous studies have shown a declining trends in the past five decades. Migliorini and Pepperell recorded 43% in 1977,<sup>[17]</sup> Yla-Outinen *et al.* had 16.2% in 1985,<sup>[16]</sup> and Katz *et al.* in his study in 1988 had 5.5%.<sup>[18]</sup> Enekpene, *et al.*

in Ibadan Nigeria recorded a perinatal mortality of 40.3% in 2006.<sup>[5]</sup> The perinatal mortality recorded in this study is similar to that recorded by Enekpene but is much higher than 3.9% and 1.2% recorded by Uygur *et al.* and Dilbaz, *et al.* in their studies respectively. This study did not show a significant reduction in the trend of perinatal mortality associated with umbilical cord prolapse as recorded in studies from other countries. This comparatively high mortality in this study as well as the study in Ibadan may be explained by the large number of unbooked cases recorded in these two studies 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 had immediate caesarean section with good perinatal outcome.

To ensure a good perinatal outcome following umbilical cord prolapse, a 24-hour available Obstetrician in our hospital should be sustained as an important contributing factor. Therefore the time from diagnosis to emergency Caesarean delivery may have been relatively short, though not well defined in this study due to a relatively poor record keeping in our hospital. Hence, patients with an umbilical cord prolapse within the hospital had better outcome than those with a prolapse outside the hospital from the fetal standpoint. Ylä Outinen *et al.* in their study supported the view that the longer the time interval between diagnosis and delivery, the higher the risk of low Apgar scores and of stillbirth or neonatal death.<sup>[16]</sup>

The limitation in the study is nonavailability of accurate timing of the interval between the time of diagnosis and the time of delivery and its effect on the fetal outcome. Also the risk of spontaneous membranes rupture and artificial rupture of the membranes were not analyzed in this study.

This study has justified prompt Caesarean section as the treatment of choice when cord prolapse is diagnosed, when the fetus is still alive, and when delivery is not imminent. Successful fetal outcome can be enhanced by promptly taking steps that will prevent cord compression by the presenting part. Enroute to the operating theatre elevating the presenting part by infusion of the bladder with normal saline and manual elevation with the attendants hand in the vagina may be helpful to prevent cord compression.<sup>[6]</sup> These were done for most of our patients. Some studies have suggested tocolysis as being helpful in improving perinatal outcome; however, this is not routinely done in our hospital. One of the factors associated with improved perinatal mortality rate is most probably improvement in neonatal intensive care.

Although there are reports indicating that polyhydramnios, spontaneous rupture of the membranes, early amniotomy, and high Bishop score are associated with an increased risk of umbilical cord prolapse,<sup>[1]</sup> our study did not evaluate such risk factors, and therefore they are subjects for future investigations in our hospital.

## Conclusion

Our findings in this study have confirmed an association between increased risk of umbilical cord prolapse and abnormal fetal presentation, low birth weight, and unbooked status. It is therefore suggested that pregnant women should be encouraged to register early in pregnancy for antenatal care and this will enhance the early identification of these risk factors and an appropriate management instituted including prompt Caesarean section delivery which results in a significantly decreased risk of perinatal mortality.

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