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Risk factors and perinatal outcome of umbilical cord prolapse in Sagamu, Nigeria

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Abstract

Background: Umbilical cord prolapse is an obstetric emergency that threatens the life and well-being of the foetus and also increases maternal morbidity. Foetal survival in umbilical cord prolapse can be enhanced through prevention prompt diagnosis and decisive intervention.
Objective: To determine the incidence, the risk factors and the perinatal outcome of cord prolapse.
Methods: This was a 13-year retrospective case-control study of cases of umbilical cord prolapse managed at the OOUTH, Sagamu, south-west Nigeria between January 1st, 2003 and December 31st, 2015. There were 54 cases and 162 controls. The major outcome measure was the fifth minute Apgar score.
Results: During the study period, the incidence of umbilical cord prolapse was 1 in 122 deliveries (0.82%). The cases of umbilical cord prolapse were nine times more likely to be unbooked, and the products were more than twice likely to be preterm when compared to the controls (OR = 9.49, p< 0.001; OR = 2.45, p< 0.001 respectively). The umbilical cord prolapse occurred five times (33.3%) in association with breech presentation and eleven times (18.5%) in transverse lie compared to the controls. The occurrence of breech presentation among the control cases was 8.6% (p<0.001) and that of the transverse lie was 1.9% (p<0.001). The differences between the cases of cord prolapse and the controls regarding prematurity, low birth weight, unbooked status and multiparity were also significant. The perinatal mortality rate in umbilical cord prolapsed was 222/1000 (22.2%) compared to 68/1000 (6.8%) for the control group.
Conclusion: Early registration for antenatal care should be encouraged as this will enhance early identification of the risk factors for umbilical cord relapse and institution of appropriate interventions.

Keywords: Cord prolapse, Emergency Obstetric care, Perinatal outcome, Risk factors.

Introduction

Umbilical cord prolapse is an obstetric emergency that threatens the life and well-being of the foetus and also increases maternal morbidity. Cord prolapse refers to the descent of the foetal umbilical cord into the lower uterine segment, where it may be adjacent to the presenting part (occult cord prolapse) or below the presenting part (overt cord presentation) in the presence of ruptured foetal placental membranes. In occult cord prolapse, the umbilical cord is not palpable during pelvic examination, whereas in funic (cord) presentation, which is characterised by prolapse of the umbilical cord below the level of the presenting part before the rupture of membranes occurs, the cord often can be easily palpated through the membranes.

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Overt cord prolapse is associated with the rupture of the membranes and displacement of the umbilical cord into the vagina, often through the introitus. [1-3] It is an obstetric emergency because the prolapsed cord is vulnerable to compression, umbilical vein occlusion and umbilical artery vasospasm, which can compromise foetal oxygenation. [1,2] The incidence of umbilical cord prolapse varies between 0.14% and 0.62%. [1, 4-6] The incidence has fallen over decades due to increased use of elective and intrapartum caesarean section for non-cephalic presentations or unengaged presenting parts and a more active approach to the intrapartum management of preterm pregnancies. [6,7]

A review of the obstetric literature indicated that the primary cause of cord prolapse is incomplete fitting of the presenting part or when the presenting part fits snugly into the maternal pelvis at the time of rupture of membranes. The known risk factors include foetal malpresentation, low birth weight, multiparity, preterm delivery, contracted pelvis, multiple pregnancy and low-lying placenta. [6, 8] Most of the risk factors for cord prolapse are mostly unavoidable. [1]

Cord prolapse is associated with high perinatal mortality. However, the perinatal mortality rate associated with umbilical cord prolapse has fallen, from as high as 375 per 1000 between 1924 and 1948 to between 36 and 162 per 1000 within the past few decades. [9 - 11] Collae also reported a perinatal mortality of 20% of all overt cord prolapse [12] The cause of death for infants born after umbilical cord prolapse now seems to be related more to the complications of prematurity and low birth weight than to intrapartum asphyxia *per se.* [3, 7] With the introduction and use of electronic foetal heart rate monitoring in recent years, variable deceleration pattern has been associated with umbilical cord prolapse and partial occlusion. The electronic foetal monitoring has aided the diagnosis and early intrapartum intervention in cord prolapse. Unfortunately, many obstetric units in developing countries lack these continuous foetal monitoring facilities, and this is compounded by the difficulty in mobilising the theatre for emergency caesarean section. In addition, some pregnant women with cord prolapse may need to travel long distances to access hospitals equipped for emergency caesarean section. These factors contribute to the high perinatal mortality rate associated with cord prolapse. [5]

Foetal survival in umbilical cord prolapse can be enhanced by prompt diagnosis and decisive intervention. Various manipulations including manual and positional elevation of the presenting part above the pelvic brim have been applied while preparing for delivery. [2] Emergency caesarean section is recommended if the foetus is alive and the cervical os is not fully dilated. If the cervix is fully dilated, the pelvis is adequate, and the foetal head is accessible, vacuum extraction or forceps delivery, or breech extraction in a breech presentation may be the quickest means of delivery. [13]

Recent data on the incidence, risk factors and perinatal outcome of cord prolapse in our centre are not available, hence the need for this study. This was a retrospective case-control study of all cases of umbilical cord prolapse managed at the Olabisi Onabanjo University Teaching Hospital, Sagamu, Nigeria over a 13-year period, to determine the incidence, risk factors and the perinatal outcome of cord prolapse.

Methods

All the cases of umbilical cord prolapse managed at the Olabisi Onabanjo University Teaching Hospital, Sagamu, Nigeria between January 1st 2003 and December 31st 2015 were reviewed retrospectively. The study was approved by the hospital research ethics committee. There were 54 cases of umbilical cord prolapse during the 13-year period. Three controls per case were randomly selected from the remaining births by selecting the patient just before and the patient just after the cord prolapse from the birth records and the third control was chosen from the first recorded case of each page of the birth record. A total of 162 controls were used in this study.

The sources of data were the labour ward birth record, neonatal intensive care unit admission record and case notes retrieved from the medical information department of the hospital. The data obtained included the parity, gestational age, booking status and route of delivery. Data were also gathered on the number of foetuses (singleton or multiple), foetal presentation, Apgar scores at the first and fifth minutes, whether or not the neonate survived, the birth weight and time interval between diagnosis and delivery. The major outcome measure was Apgar score at the fifth minute.

Umbilical cord prolapse was defined as the palpation of the umbilical cord below the presenting part following rupture of membranes. Foetuses with congenital abnormalities diagnosed in-utero or after delivery were excluded from the study. For all the cases of cord prolapse with live foetuses on admission, manual elevation of the presenting part or instillation of 500 to 700mls of Normal Saline into the bladder (to elevate the foetal presenting part) and head-down position of the patient were adopted during transfer to the theatre or delivery suite for immediate delivery. Emergency caesarean section was done for the majority of the cases in this study.

Data analysis was done using Software Package for Social Sciences (SPSS) 17.0. The odds ratios were calculated to identify the relationship between cord prolapse and some of the potential risk factors. The adjusted (corrected) odds ratios were calculated using the Mantel-Haenszel method and a p value less than 0.05 was considered as significant at 95% confidence interval.

Results

There were 6,946 deliveries during the period studied out of which there were 57 cases of cord prolapse. Therefore, the incidence was 1 in 122 (0.82%). Only the records of 54 cases were available for review, giving a retrieval rate of 94.7%.

During the study period, the caesarean section rate was 30.7% (2134 cases), and cord prolapse was the indication in 2.1% (45 cases) of all the caesarean sections. A total of 45 (83.3%) of all cases of umbilical cord prolapse were delivered by caesarean section while 19 (11.7%) of the controls had caesarean section ($p < 0.001$). Of 9 (16.7%) of the cases of umbilical cord prolapse delivered vaginally, 3 (5.6%) were delivered by vertex spontaneously while 6 (11.1%) had assisted breech delivery.

All these foetuses were already dead before presentation in the hospital. The mean decision-delivery interval was 80.02 ± 20.04 minutes. The prolonged decision-delivery interval was caused by some logistic problems such as epileptic electric power supply, difficulty in securing blood from the blood bank and slow response of the theatre team.

The relationship between the parity, booking status, presentation, number of foetuses, birth weight and umbilical cord prolapse are shown in Tables I and II. Of the 54 cases, 44 (81.5%) were multiparous compared to 88 (54.3%) of the control group (OR = 3.88, CI = 1.95-7.79, p<0-001). Thirty-seven (68.5%) of the cases were unbooked compared to 31 (19.1%) of the control group (OR = 9.49, CI = 4.70-19.35, $p<0.001$). There were 27 (50%) preterm deliveries among the cases compared to 25 (15.4%) of the control group (OR = 5.67, CI = 2.75-11.80, $p<0.001$).

A total of 23 (42.6%) of all the cases presented cephalic while 145 (89.5%) of the control group presented cephalic (OR = 0.09, CI = 0.04-0.20). Breech presentation and transverse lie constituted 18 (33.3%) and 10 (18.5%) respectively of cases of umbilical cord prolapsed compared to 14 (8.6%) and 3 (1.9%) respectively of the control group (OR = 4.98, CI = 2.11-12.06 and OR = 11.49, CI = 2.47-73.69 respectively).

Spontaneous rupture of membranes occurred in 50 (92.6%) of the cases compared to 79 (48.8%) of the control group (OR = 13.83, CI = 5.51-26.23, $p<0.001$). On the other hand, only 4 (7.4%) of the cases of cord prolapse had artificial rupture of membranes whereas 83 (51.2%) of the controls had artificial rupture of membranes (OR = 0.07, CI = 0.03-0.18, $p< 0.001$).

Table I: Relationship between maternal risk factors and umbilical cord prolapse

Maternal risk factors	Study group N = 54		Control group N = 162		OR	95% CI	p value
	n	%	n	%			
Age (years)							
19 and below	2	3.7	5	3.1	1.35	0.25-7.82	0.7
20-24	7	13.0	7	4.3	3.59	1.04-13.59	0.022
25-29	20	37.0	55	34.0	1.14	0.61-2.12	0.658
30-34	13	24.1	54	33.3	0.64	0.33-1.25	0.159
35-39	10	18.5	37	22.8	0.79	0.38 1.64	0.488
40 and above	2	3.7	4	2.5	1.35	0.25-7.82	0.701
Parity							
Nullipara	10	18.5	74	45.7	0.28	0.14-0.54	<0.001
Multipara	44	81.5	88	54.3	3.88	1.95-7.79	<0.001
Booking status							
Booked	17	31.5	131	80.9	0.11	0.05-0.22	<0.001
Unbooked	37	68.5	31	19.1	9.49	4.70-19.35	<0.001

OR= Odds ratio, CI= Confidence interval

Perinatal outcomes of both study and control groups are shown in Table III. Of the 54 cases of umbilical cord prolapse that were admitted, The babies of 39 (72.2%) cases had an Apgar score of less than 7 in the first minute compared to 53 (32.7%) of the control group (p<0.001). The Apgar score at the fifth minute showed was less than 7 among 33 cases (61.1%) compared to 16 (9.9%) in the control group (p<0.001). Only three of the babies in the study group that had low Apgar score at the fifth minute suffered early neonatal death following emergency caesarean section, and the remaining 30 neonates were discharged in good condition.

There were 12 (22.2%) cases of perinatal death among the cases compared to 11 (6.8%) in the control group (p = 0.003). The perinatal mortality rate for the cases was 222/1000 total births compared to 68/1000 total births for the control group. All the 12 perinatal mortalities among the cases of umbilical cord prolapse were unbooked pregnancies. Of these 12 perinatal mortalities, 9 foetuses were already dead before presentation in the hospital while the other 3 died from severe birth asphyxia in the early neonatal period.

Discussion

Apparently, normal pregnancy assessed to be low-risk can suddenly transform into a catastrophic emergency as a result of umbilical cord prolapse. This condition is associated with high foetal morbidity and mortality and increases maternal risk significantly during delivery. [13] Early diagnosis and prompt delivery usually result in satisfactory foetal outcome. Therefore, it is important that the obstetrician identifies the risk factors of umbilical cord prolapse in individual patients in the course of the pregnancy and take appropriate action.

Table II: Relationship between foetal risk factors and umbilical cord prolapse

Foetal risk factors	Study group N=54		Control group N=162		OR	95% CI	p value
	n	%	n	%			
Gestational age							
Preterm	27	50	25	15.4	5.67	2.75-11.80	< 0.001
Term	27	50	137	84.6	0.18	0.08-0.36	< 0.001
Presentation							
Vertex	23	42.6	145	89.5	0.09	0.04-0.19	< 0.001
Non vertex	31	57.4	17	10.5	10.73	4.85-24.28	< 0.001
Cephalic	23	42.6	145	89.5	0.09	0.04-0.20	< 0.001
Breech	18	33.3	14	8.6	4.98	2.11-12.06	< 0.001
Transverse	10	18.5	3	1.9	11.49	2.47-73.69	< 0.001
Compound	3	5.6	0	0			
Number of foetus(es)							
Singleton	41	75.9	146	90.1	0.35	0.15-0.83	0.0085681
Multiple	13	24.1	16	9.9	2.84	1.20-6.83	<0.001
Birth weight							
Less than 2.5kg	22	40.7	29	17.9	3.17	1.58-6.38	<0.001
2.5kg and above	32	59.3	133	82.1	0.32	0.16-0.63	0.0013747

OR= Odds ratio, CI= Confidence interval

Table III: Perinatal outcome of umbilical cord prolapse with controls

Perinatal outcome	Study Group		Controls		P alue
	n	%	n	%	
Perinatal death	12	22.2	11	6.8	0.003
Apgar score at 1 minute	39	72.2	53	32.7	<0.001
Apgar score at 5 minutes	33	61.1	16	9.9	<0.001

The incidence of umbilical cord prolapse of 0.82 in this study was higher than the range of 0.19-0.47% reported from other parts of Nigeria,[6,14,15] and 0.14-0.62% for the developed world.[1,9] The relatively high incidence in the present study may be related to the tertiary status of the location of the survey. Complicated obstetric cases are usually referred to the facility with lesser number of normal deliveries, which often took place at the lower health centres, maternity homes and traditional birth attendant homes. This observation was corroborated by a study carried out at the same centre by Lamina *et al*. which showed that 52.7% of patients who booked at the centre gave various reasons for preferring to deliver their babies elsewhere. [16]

Non-vertex presentation, multiple gestations, preterm delivery and low birth weight significantly increased the risk of umbilical cord prolapse. Abnormal foetal presentation (breech presentation, transverse or oblique lie) have consistently been identified as major risk factors for cord prolapse. [2, 4, 6, 15] This trend was also confirmed in the present study. Multiple pregnancies have also been associated with umbilical cord prolapse [2, 4, 9, 17] as observed in the present study. The risk is believed to be higher for the second twin who is also at increased risk of malpresentation, an important cause of cord prolapse.

Spontaneous rupture of foetal membranes increases the risk of cord prolapse as the umbilical cord easily flows out with the gush of liquor. This was observed in the present study. Similar findings had been reported in Ankara, Turkey and Maiduguri, north-west Nigeria. [1, 17] This calls for early amniotomy with slow release of liquor in high-risk patients. In the same vein, the vaginal examination done before amniotomy allows for detection of cord presentation and deliveries with cord presentation have a better perinatal outcome than those with cord prolapse. [18]

Preterm delivery is also known to be associated with increased risk of umbilical cord prolapse as previously reported by Kalu and Umeora. [4] The present study also supported this observation (OR = 5.67). The association between low birth weight and umbilical cord prolapse has been suggested in some previous studies.[1,2,4,6] Dilbaz *et al*. [1] and Kalu and Umeora found that the occurrences of low birth weight (babies weighing less than 2.5 kg) were 5 and 2.70 times respectively more likely in cases of cord prolapse than the control group. [4] However, Uygur *et al*. did not report similar association between low birth weight and umbilical cord prolapse. [19] In the present study, 17.9% of the controls had birth weight of less than 2.5 kg compared with 40.7% of the cases with umbilical cord prolapse (OR = 3.17). Therefore, this study also corroborated a positive association between birth weight less than 2.5 kg and umbilical cord prolapse.

Studies have shown positive correlation between parity and uterine size. [13, 20] The larger intrauterine space in multiparous women allows for easy slippage of the umbilical cord leading to cord prolapse. The incidence of multiparity among the patients with umbilical cord prolapse was significantly higher compared to the control group (OR = 3.88). A few of the previous studies have shown the association between unbooked status and cord prolapse. [4, 19] The present study also recorded a significant association between umbilical cord prolapse and unbooked status (OR = 9.49). This observation may explain the findings that all the twelve perinatal mortalities recorded in this study occurred among women with unbooked pregnancies and nine out of these foetuses were already dead before arrival in the hospital. The poor outcome in these instances may be attributable to delayed care seeking attitude of the unbooked patients. A similar finding of high perinatal mortality among unbooked patients had earlier been reported

from north-west and northeast Nigeria. [14,16]

The commonest mode of delivery for women with cord prolapse was caesarean section which was offered to 83.3% of the patients. This was similar to 80% and 84.4% previously reported from Hong Kong and Abakaliki, south-east Nigeria but higher than 42%, 50% and 68.4% reported from Kaduna, north-west Nigeria, Maiduguri, northeast Nigeria and the United States of America respectively. [4, 13, 14, 16] However, the caesarean section rate was lower than 93.5% reported from Saudi Arabia. [19] The high caesarean section rate was necessary to salvage the babies of 83.3% of the pregnant women that presented at cervical dilatation less than 7cm with live foetuses. The present study seemed to have justified prompt caesarean section as the treatment of choice when cord prolapse is diagnosed with live foetus and spontaneous delivery is not imminent. Successful foetal outcome can be enhanced by promptly taking steps that will prevent cord compression by the presenting part. Enroute the operating theatre, elevating the presenting part by infusion of the bladder with normal saline and manual elevation of the presenting part with the attendant's hand in the vagina may be helpful in preventing cord compression. [2] These were done for most of the patients in the present study. Some studies have also suggested tocolysis as a useful intervention in improving perinatal outcome. However, this is not routinely done in our hospital. One of the factors associated with improved perinatal survival rate, is most probably, the improvement in neonatal intensive care.

The mean decision-delivery interval of 80.02 ± 20.04 minutes in this study was much higher than the recommended 20 to 30 minutes [25-27] for excellent foetal outcome. However, none of the babies whose mothers were delivered within 60 minutes of decision-delivery interval suffered perinatal mortality. This gave credence to the fact the diagnosis-delivery interval determines the survival of such babies. The longer decision-delivery interval observed in this study was due to logistic problems such as electric power outages, slow response of the supporting theatre team and difficulty in securing safe blood from the blood bank.

Although reports are indicating that polyhydramnios, early amniotomy and high Bishop's score are associated with increased risk of umbilical cord prolapse, [1] the present study did not evaluate such risk factors, and therefore they are subjects for future investigations.

The inability to retrieve all the case records of the identified patients diagnosed with umbilical cord prolapse was a limitation to the study. However, a retrieval rate of 94.7% fell within an acceptable limit, and this would not have had a significant effect on the results. Secondly, the cases and the controls were not matched for some special features like parity, gestational age and booking status. However, the random sampling of controls reduced the degree of bias in this study.

Conclusion

The findings in this study have corroborated the relationships between increased risk of umbilical cord prolapse and abnormal foetal presentation, preterm delivery, low birth weight and unbooked status. Therefore, it is suggested that pregnant women should be encouraged to register for antenatal care early in pregnancy as this will enhance early identification of the risk factors and facilitate prompt caesarean section delivery with improved perinatal survival.

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References

1. Dilbaz B, Ozturkoglu E, Dilbaz S, Sivaslioglu AA, Haberal A. Risk factors and perinatal outcomes associated with umbilical cord prolapse. Arch Gynaecol Obstet 2006; 274: 104-107.
2. Bush M, Eddleman K, Belogolovkin V. Umbilical cord prolapse. Uptodate 2016; 16(3): 10-14.
3. Gabbay-Benziv R, Maman M, Wiznitzer A, Linder N, Yogev Y. Umbilical cord prolapse during delivery- risk factors and pregnancy outcome: a single center experience. J Matern Fetal Neonatal Med. 2014; 27(1):14
4. Kalu CA, Umeora OUJ. Risk factors and perinatal outcomes associated with umbilical cord prolapse in Ebonyi State University Teaching Hospital, Abakaliki, Nigeria. Niger J Clin Pract 2011; 14: 413-417.
5. Enekpene CA, Omigbodun AO, Arowojolu AO. Perinatal mortality following umbilical cord prolapse. Int J Gynaecol Obstet 2006; 95: 44-45.
6. Gannard-Pechin E, Ramanah R, Cossa S, Mulin B, Maillet R, Riethmuller D. Umbilical cord prolapse: a case study over 23 years. Gynecol Obstet Biol Reprod (Paris) 2012; 41(6): 574-583.
7. Gibbons C, O'HHerlihy C, Murphy JF. Umbilical cord prolapse- changing patterns and improved outcomes: a retrospective cohort study. Brit J Obstet Gynaecol 2014; 121: 1705.
8. Lin MG. Umbilical cord prolapse. Obstet Gynecol Surv 2006; 61: 269.
9. Koonings PP, Paul RH, Campbell K. Umbilical cord prolapse. A contemporary look. J Reprod Med 1990; 35: 690-692.
10. Fenton AN, d' Esopo A. Prolapse of the cord during labor. Am J Obstet Gynaecol 1951; 62: 52-64.
11. Melseh T, Sultan M, Sabagh T, Algwiser A. Umbilical cord prolapse. J Obstet Gynaecol 1999; 13: 24-28.
12. Collae JV. Malpresentation and cord prolapse. In: Decherney AH, Pernoll ML (Editors). Current Obstetric and Gynaecological Diagnosis and Treatment. 8th Ed. New York: Lange Medical Books; 1998. p.410-427.
13. Behbehani S, Patenaude V, Abenhaim HA. Maternal risk factors and outcome of umbilical cord prolapse. J Obstet Gynecol Can 2016; 38(1): 23-28.
14. Onwuhafua P, Adesiyun G, Ozed-Williams I, Kolawole A, Ankama A, Duro-Mohammed A. Umbilical cord prolapse in Kaduna, Northern Nigeria: a study of incidence. Niger J Clin Pract 2008; 11(4): 316-319.
15. Esike OUC, Ojiaku IO, Eze JN, Umeora OUJ, Aluka CO, Twomey DE. Umbilical cord prolapse in a secondary health center in South Eastern Nigeria: A 20-year experience. Afr J Med Health Sci 2015; 14(2): 115-119.
16. Lamina MA, Sule-Odu AO, Jagun EO. Factors militating against delivery amongst patients booked in Olabisi Onabanjo University Teaching Hospital, Sagamu. Niger J Med 2004; 13(1): 52 – 55.
17. Bako B, Chama C, Audu BM. Emergency obstetric care in a Nigerian Tertiary Hospital: A 20-year review of umbilical cord prolapse. Niger J Clin Pract 2009; 12(3): 232-236.
18. Beloqolovkin V, Bush M, Eddleman K. Umbilical cord prolapse. In: Up To Date version, 14.2,2006 on CD Rom.
19. Uygur D, Kis S, Tuncer R, Ozcan FS, Erkaya S. Risk factors and infant outcomes associated with umbilical cord prolapse. Int J Gynaecol Obstet 2002; 78: 127-130.
20. Faiz SA, Habib FA, Sporrong BG, Khalil NA. Results of delivery in umbilical cord prolapse. Saudi Med J 2003; 24(7): 754-757.