Advanced abdominal pregnancy at a tertiary hospital in South Africa: a case series

Shannon Harries; Lloyd Tooke; Jean-Christophe Imbeault; Mushi Matjila; Shakti Pillay

BACKGROUND: Advanced abdominal pregnancy occurs when the products of conception implant within the peritoneal cavity, external to the fallopian tubes and myometrium, beyond 20 weeks gestation. This is a rare condition that typically carries high maternal and neonatal mortality and morbidity especially in low middle income countries.

OBJECTIVE: To describe the outcomes of advanced abdominal pregnancies over 14 years at a tertiary neonatal unit.

STUDY DESIGN: This case series retrospectively analyzed 17 extrauterine pregnancies at Groote Schuur Hospital in Cape Town, South Africa. Seventeen mothers and 18 babies were included in the analysis. Data analysis focused on maternal history, risk factors, delivery complications, intraoperative findings, and neonatal outcomes. Microsoft StatPlus was used for statistical calculations.

RESULTS: Of the 17 pregnancies, 16 were singleton births and one was a set of monochorionicmonoamniotic twins. In 14 cases (82.4%—14/17), the diagnosis was missed on the initial ultrasound scan. Sixteen (94.1%—16/17) deliveries were expedited within 48 hours of diagnosis. All deliveries were performed via open laparotomy under general anesthesia. There were 2 maternal deaths, and all cases involved at least 1 maternal complication. Thirteen (76.5%—13/17) placentae were implanted on multiple sites including the uterus, adnexa, omentum and bowel. Of the 18 babies, 12 (66.7%—12/18) were born alive, with 1 early and 1 late neonatal death. The median birth weight of live-born babies was 1313 grams (interquartile range: 970−2250 g). The median Apgar score was 5 (interquartile range: 3−6) at 1 minute and 7 (interquartile range: 4−8) at 5 minutes. Two (16.7%—2/12) babies had transient cranial asymmetry. The median length of hospital stay for the ten babies discharged home was 32 days (interquartile range: 19−41 days).

CONCLUSION: Advanced abdominal pregnancies, when detected early and managed at well-resourced tertiary hospitals, can result in favorable outcomes. This is the first case series from a low- and middle-income country demonstrating such positive neonatal outcomes.

Key words: advanced abdominal pregnancy, case series, extrauterine pregnancies, neonatology, obstetrics

Introduction

Background

An abdominal pregnancy occurs when the products of conception implant within the peritoneal cavity, external to the fallopian tubes and myometrium. Implantation sites include the omentum, pelvic sidewall, broad ligament, posterior cul-de-sac, uterine serosa, other abdominal organs (spleen, bowel, liver), large pelvic vessels, and the diaphragm.[1] Abdominal pregnancies may be primary (direct implantation in the peritoneal cavity) or secondary (following rupture of a tubal pregnancy that re-implants within the abdominal cavity or tubo-abdominal abortion) with some definitions including ruptured uterine pregnancies.[2,3]

An advanced abdominal pregnancy is defined as an extrauterine pregnancy that progresses beyond 20 weeks of gestation; 1 case series used 18 weeks and another 22 weeks as the threshold.[4−6] Risk factors for advanced abdominal pregnancy include smoking, history of previous uterine surgery, pelvic inflammatory disease, ectopic pregnancies and some assisted reproductive techniques, such as in-vitro fertilization.[7−9] Limited access to prenatal care and early antenatal ultrasound scans can contribute to delayed diagnosis.[10] This rare condition, occurring in 1 in 10,000 to 30,000 pregnancies, is associated with significant maternal, fetal, and neonatal morbidity and mortality.[3,4,11] Data on incidence and outcomes, particularly in low- and middle-income countries, are scarce, with most published data derived from isolated case-reports or case-series from individual settings over extended periods.[3,4,11] One case series from Nigeria (1976−2006) reported good maternal survival (19 out of 20 mothers), but a perinatal survival of only ten percent.[6] Another South African study showed a maternal survival of 20 out of 21, and perinatal survival of 14%.[12]

Maternal death is often due to catastrophic hemorrhage, with reported mortality rates as high as 20%, particularly when the placenta is left in-situ.[6,13] An advanced abdominal pregnancy is also associated with significant neonatal morbidity and mortality, including a high incidence of congenital malformations. These malformations, primarily related to pressure effects and reduced amniotic fluid volume, include facial and cranial asymmetry, hypoplastic limbs, joint (talipes equinovarus) and

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Why was this study conducted?

Outcomes of advanced abdominal pregnancies in low- and middle-income countries are generally poor. Groote Schuur Hospital in Cape Town is a referral center for these cases.

Key findings

There were 17 advanced abdominal pregnancies (1 set of twins). Intraabdominal hemorrhage was the most common complication, with 2 maternal deaths. Twelve babies were born alive, of which 10 were discharged home

What does this study add to what is already known?

In advanced abdominal pregnancies favorable neonatal outcomes are possible in low middle income countries in a well-resourced hospital setting

central nervous system anomalies.[6,13] Fetal and perinatal mortality rates range between 72% and 90%.[6,13]

Diagnosis

Clinical presentation

The clinical presentation of advanced abdominal pregnancy varies depending on the implantation site, which poses significant diagnostic challenges. Some women may remain asymptomatic until late-stage complications arise, while others present with an acute abdomen and hypovolemic shock secondary to intra-abdominal hemorrhage, related to placental separation or rupture of maternal blood vessels or organs.[7,14,15] In rare instances, the diagnosis is made following a failed induction.[16]

Imaging and surgery

Imaging, particularly early antenatal ultrasound, may be useful in identifying the abdominal location of pregnancies, enabling timely management.[3] However, distinguishing an abdominal pregnancy from other types of extrauterine pregnancies (cornual, tubal, ovarian) can be challenging, with only 50% of early abdominal pregnancies correctly identified on initial scans.[17] In addition, ultrasound is highly operator-dependent, even skilled operators may miss the diagnosis on multiple repeat scans, particularly in cases with complex anatomy and with technically difficult scans.[18,19]

Magnetic resonance imaging is an alternative imaging tool with improved sensitivity and specificity compared to ultrasound; it is also superior to ultrasound in delineating the anatomy and identifying the relationship between the placenta and adjacent maternal organs.[20,21] The use of magnetic resonance imaging is limited by cost, access and feasibility, particularly in low- and middle- income countries.

In high-income countries, early diagnosis of abdominal pregnancy, often before 24, has led to a proactive approach where termination is typically offered at the time of diagnosis, due to the minimal likelihood of delivering a healthy baby and the risk of maternal complications.[22,23] In contrast, in low- and middle- income countries, the diagnosis is frequently missed due to resource constraints, such as inadequate access to antenatal ultrasound, poor maternal access to antenatal care, and socioeconomic barriers to healthcare. Consequently, most cases are only identified intraoperatively during exploratory laparotomies.[2,13,24] Recent literature on abdominal pregnancies is predominantly from LMICs.[25] Although there are isolated case reports demonstrating favorable outcomes[19,26] larger case series show a high perinatal mortality rate.[6,24]

Study rationale

Groote Schuur Hospital is a tertiary academic hospital within the Cape Metro-West district, with access to surgical, urological, and anesthetic specialists. The 70-bedded neonatal unit which includes 20 neonatal intensive care unit beds, provides care to nearly half of Cape Town's population of 5 million people. On average, there are 3000 live births per annum, most of which are considered high-risk pregnancies.[27]. We conducted a 14-year retrospective folder review of maternal and perinatal outcomes of advanced abdominal pregnancies at this tertiary facility.

Objectives

To describe the outcomes of advanced abdominal pregnancies over 14-years at a tertiary-level obstetric and neonatal unit in Cape Town, South Africa.

Subjects and methods

Study design and setting

The study was a retrospective descriptive case series of advanced abdominal pregnancies, between January 2010 and December 2023. As all advanced abdominal pregnancies require abdominal surgery, maternity theatre records over the 14-year study period were reviewed to identify definite or probable cases of advanced abdominal pregnancies based on the diagnosis documented in the maternity theatre case list and birth register books. Confirmatory diagnoses were made through a detailed review of maternal and neonatal medical records.

Study population

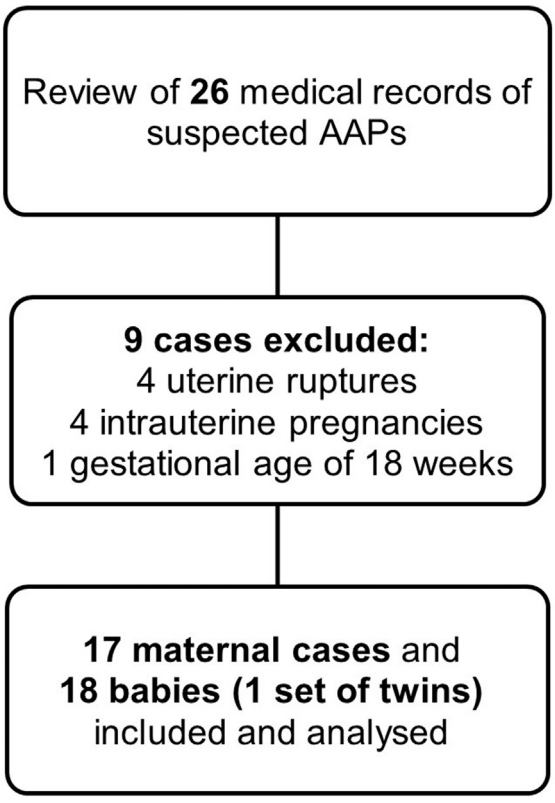
Inclusion criteria. All mothers confirmed to have an advanced abdominal pregnancy and their perinatal outcomes in the 14-year study period were included.

Exclusion criteria. Early abdominal pregnancies less than 20 weeks gestation were excluded.

Data collection methods and management

De-identified maternal and neonatal clinical data were extracted from hospital medical records and manually entered onto a case report form. Data from each case report form were then

FIGURE 1
Case inclusion flow chart.



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entered onto a secure, password-protected Microsoft Excel spreadsheet, with access restricted to study staff only.

Data analysis

Data were analyzed descriptively. Means and standard deviations for normally distributed continuous data, and medians and inter-quartile ranges for non-normally distributed data, alongside appropriate frequencies and percentages. Microsoft StatPlus was used for statistical calculations.

Ethical considerations

Ethical approval was obtained from the University of Cape Town's Faculty of Health Sciences Human Research Ethics Committee (UCT FHS-HREC 360/2021). Hospital approval was also granted.

Results

Medical records of 26 mothers with suspected advanced abdominal pregnancies were reviewed. Nine cases were excluded from the data analysis. Four with uterine rupture (3 of which were scar ruptures). Four with intrauterine pregnancies and 1 with a gestation less than 20 weeks (Figure 1). One mother with monochorionic monoamniotic twins was included. Therefore, 17 women with confirmed advanced abdominal pregnancies and 18 babies were included in the final data analysis.

Maternal demographic data

Seventeen mothers were included (Table 1), with ages ranging between 18 and 44 years (median: 33 years, interquartile range: 27.5−37 years). Seven (41.2% 7/17) mothers had risk factors for an advanced abdominal pregnancy. Two were smokers and 5 had a history of previous abdominal surgery (4 previous caesarean sections and 1 previous ectopic pregnancy).

Timing of diagnosis

The median gestational age at the first antenatal visit was 15^{+5} weeks (interquartile range: 12^{+4}−20 weeks). Three (17.7%—3/17) mothers attended their first antenatal visit in the first trimester, 11 (64.7%—11/17) in the second trimester and 3 (17.7%—3/17) received no antenatal care prior to diagnoses. All 17 mothers had at least one antenatal ultrasound scan. Fourteen (82.4%—14/17) mothers were undiagnosed on initial ultrasound. The diagnosis of advanced abdominal pregnancy was confirmed on the first ultrasound in 3 cases (17.6%—3/17), the second ultrasound in 8 cases (47.1%—8/17), the third in 4 cases (23.5%—4/17) and the fifth in 1 case (5.9%—1/17). The diagnosis was suspected on an informal ultrasound scan in 1 case (5.9%—1/17), which was confirmed on magnetic resonance imaging. The median gestational age at diagnosis was 31^{+4} weeks (interquartile range: 25^{+2}−35 weeks). Sixteen (94.1%—16/17) deliveries were expedited within 48 hours of diagnosis, 1 (5.9%—1/17) case was diagnosed 5 days prior to delivery.

Surgery and anesthesia

All 17 deliveries were performed via open midline laparotomy under general anesthesia. The median duration of surgery was 94 minutes (interquartile range: 46.5−122 minutes).

Maternal outcomes

There were 2 (11.8%—2/17) maternal deaths. Both required emergency laparotomy. One mother was hemodynamically stable prior to laparotomy but had major obstetric hemorrhage (10,000 mL) and remained unstable despite massive blood transfusion and hemostasis. She was transferred to main ICU, remained unstable (hypovolemic shock and disseminated intravascular coagulation) and eventually died 11 hours post operatively. The second mother was hemodynamically unstable prior to arrival in theatre with an estimated intraoperative blood loss of 3700 mL. She remained unstable and required a repeat laparotomy 8 hours later which revealed a further 4000 mL intraabdominal blood loss. She died in ICU 28 hours after the initial surgery.

TABLE 1
Maternal data and intraoperative findings: placental location (n=17)

Maternal age	Gravidity	Single placental site	Placental implantation site			Removed	Maternal outcome
			Uterus	Adnexa	Bowel/other sites		
39	G3	No	Left cornua	Left adnexa	No	Yes	Discharged
40	G4	No	No	Right adnexa	Bowel	Partial—extension into pelvic side wall	Death, total abdominal hysterectomy
27	G2	No	No	Left adnexa	Omentum	Yes	Discharged
33	G4	Yes	No	Right adnexa	No	Yes	Discharged
39	G4	No	Cornua	Right adnexa	Omentum	Yes	Discharged
28	G2	Yes	No	Left adnexa	No	Yes	Discharged
35	G2	No	Fundus and posterior uterine surface	Left adnexa	No	Yes	Discharged
44	G2	No	Left fundus	No	Transverse colon	No	Discharged
35	G3	No	Left cornua	Left adnexa	Sigmoid colon and rectum	Yes	Discharged
29	G1	No	Fundus	No	Rectum, sigmoid colon, omentum, posterior cul-de-sac	Yes	Discharged
18	G1	No	Left cornua	Left adnexa	No	Yes	Discharged
32	G2	Yes	Fundus	No	No	Yes	Discharged
33	G3	No	Posterior surface	No	Rectum, posterior cul-de-sac, pelvic side wall	Yes	Death, total abdominal hysterectomy
22	G2	No	No	Right adnexa	Appendix	Yes	Discharged
35	G3	No	Left cornua	Left adnexa	Sigmoid colon, left ureter	Yes	Discharged
24	G2	Yes	No	Left adnexa	No	Partial—extension into pelvic side wall	Discharged
30	G2	No	Left cornua	Left adnexa	Small bowel and omentum	Yes	Discharged

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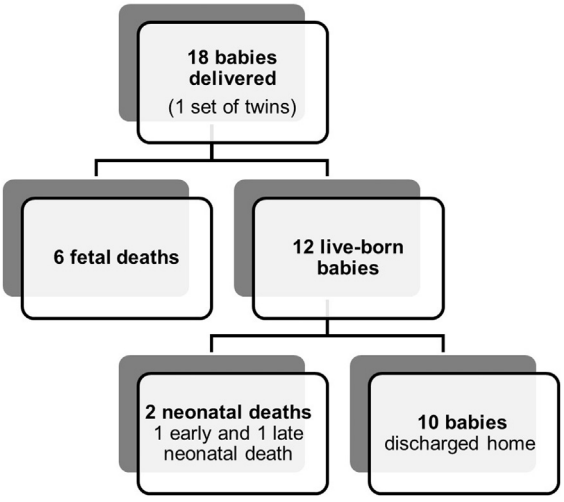
FIGURE 2
Neonatal outcomes.



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The most frequent (82.4%—14/17) maternal complication was significant blood loss requiring blood transfusion. Apart from significant hemorrhage and bowel injury which required intraoperative ileum repair for the latter, other complications included postoperative sepsis and renal impairment (associated with blood loss of 4500 mL). Eight (47.1%—8/17) mothers required main ICU admission, with a mean ICU duration of the surviving mothers of one and a half days. Nine (52.9%—9/17) mothers were admitted to obstetric special care unit post operatively. The median length of hospital stay was 7 days (interquartile range: 5.5—12 days).

Intraoperative findings

Complete intraoperative removal of the placenta was achieved in 14 cases (82.3%—14/17). In 2 cases (11.8%—2/17), the placenta was partially removed due to extension into the pelvic sidewall, and in 1 case (5.9%—1/17) the placenta was left in situ due to adherence to the uterus and transverse colon. Placental implantation sites varied, with 13 placentae (76.5%—13/17) implanted across multiple locations, including the uterus, adnexa, bowel, and omentum. Three placentae (17.6%—3/17) were implanted solely in the adnexa, while 1 (5.9%—1/17) was exclusively implanted on the external surface of the uterus at the fundus (Table 1).

Fetal and neonatal outcomes

A total of 18 babies were delivered which included 17 singletons and 1 set of monochorionic monoamniotic twins. Twelve babies (66.7%—12/18) were born alive (including the twins), while 6 fetuses (33.3%—6/18) died intraabdominally (Figure 2).

Fetal deaths

Three fetuses were previable with gestational ages of 20^{+6} weeks, 21^{+5} weeks and 24^{+5} weeks. The birthweights of the remaining 3 fetal deaths were 980 g, 2200 g and 3095 g with gestational ages of 34, 34 and 36^{+5} weeks respectively. The 980 g fetus was severely growth restricted. All 6 fetuses had no recordable fetal heart rate on ultrasound prior to the laparotomy.

Live-born babies

The median birthweight of the 12 live-born babies was 1313 g (interquartile range: 970—2250 g) (Table 2). The median gestational age was 31^{+5} weeks (interquartile range: 26—35^{+5} weeks). Three babies had extremely low birth weights (795, 810 g, 970 g). Two were severely growth restricted (810 g and 1300 g at gestational ages 31^{+4} and 32 weeks, respectively).

The median Apgar score was 5 (interquartile range: 3—6) at 1 minute and 7 (interquartile range: 4—8) at 5 minutes. Ten (83.3%—10/12) of the live-born babies were discharged home with a median length of hospital stay of 32 days (interquartile range: 19—41 days). The perinatal mortality rate in this case series was therefore 44.4%.

Mild cranial asymmetry was noted in 2 babies (16.7%—2/12). Other morbidities included respiratory distress syndrome and neonatal jaundice.

Of the 12 live-born babies, 2 (16.7%—2/12) died in hospital from causes unrelated to the advanced abdominal pregnancy. One baby (810 g, 31^{+4} weeks) died on day one of life due to fetal abnormalities identified antenatally on ultrasound scan. Medical termination of pregnancy was attempted 3 times but failed due to the extrauterine nature of the pregnancy. This baby was severely growth restricted with a large cystic hygroma, suggesting chromosomal origin of the abnormality. The other baby (1040 g, 26 weeks) died from severe necrotizing enterocolitis on day 25 of life.

Structured discussion

Principle findings

In this case series, ten (83.3%—10/12) of the live-born babies were discharged home, suggesting favorable outcomes for most advanced abdominal pregnancies. The neonatal mortality rate in this case series was low, with 2 (16.7% 2/12) of the live-born babies dying in hospital from causes unrelated to the advanced abdominal pregnancy. Six fetuses (33.3%) died intra-abdominally. The perinatal mortality rate in this case series (44.4%) is well below the reported rates in the literature between 72% and 90%.[6,12,13] We observed 2 maternal deaths (11.8%).

While favorable neonatal outcomes were a key finding in this series, maternal outcomes were consistent with prior LMIC case series, with high rates of morbidity and 2 maternal deaths. This underscores the persistent risks to maternal health in abdominal pregnancy and the need for improved systemic responses.

TABLE 2
Characteristics of live-born babies (n=12)

GA (weeks')	BW (Grams)	Apgar score		Resuscitation	[1]Steroid mature	GA at diagnosis	Antenatal ultrasound scan (US) when diagnosis made	Length of hospital stay (days)	Complications
		1 minute	5 minute						
29^{+4}	1320	5	7	Mask IPPV for 6 minutes	Yes	29^{+2}	2nd US	30	[2] Cranial asymmetry, [2] RDS
31^{+6}	1420	6	9	Mask CPAP 5 minutes	Yes	31^{+5}	1st US	34	[2] Cranial asymmetry
31^{+6}	1415	5	8	Mask CPAP 20 minutes	Yes	31^{+5}	1st US	34	[2] RDS
[3] 31^{+4}	810	3	3	None	No	31^{+3}	3rd US	1	[2] GR, congenital abnormalities
32^{+0}	1300	1	7	Mask IPPV 1 minute. Intubated	Yes	31^{+5}	1st US	27	[2] RDS, [2] GR, right sided aortic arch
37^{+0}	3320	3	4	Mask IPPV 3 minutes. Intubated	No	36^{+6}	2nd US	30	[2] RDS; PPHN required oscillation
30^{+0}	1305	4	6	Mask IPPV 4 minutes	Yes	30^{+5}	1st US	36	[2] RDS, NNJ
35^{+5}	2600	5	7	Mask IPPV 22 minutes, 1 min CPR	No	35^{+5}	5th US	4	None
26^{+0}	970	6	8	None	No	25^{+5}	2nd US	45	[2] RDS, NNJ
36^{+2}	2250	7	8	Mask CPAP	No	36^{+0}	3rd US	10	[2] RDS
25^{+0}	795	5	7	Mask IPPV for 3 minutes	No	24^{+6}	3rd US	65	[2] RDS, NNJ, NEC
[4] 26^{+0}	1040	1	1	Mask IPPV Intubated	No	26^{+0}	3rd US	25	[2] RDS, NNJ, NEC

[1]: Steroid mature—2 doses of betamethasone 24 hours apart within 7 days of birth. [2]: Probably related to the AAP. [3]: 1 early neonatal death. [4]: 1 late neonatal death

BW: birth weight*; GA:* gestational age*; CPAP:* continuous positive airway pressure *IPPV:* intermittent positive pressure ventilation*; NEC:* necrotizing enterocolitis (advanced)*; NNJ:* neonatal jaundice*; PPHN:* persistent pulmonary hypertension of the newborn*; RDS:* respiratory distress syndrome; *GR:* growth restriction.

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Results

Consistent with other studies, severe blood loss was the most common delivery complication in this series.[15,28] The 30-year review of advanced abdominal pregnancies in Nigeria similarly found that 50% of cases required blood transfusions.[6] Risk of maternal complications are increased when the placenta is left in situ, and include bowel obstruction, perforation, fistula formation, DIC, infection, abscess formation, paralytic ileus, prolonged hospital admission, and adhesions.[3,6] In this series, the placenta was left in situ in 1 case due to adherence to the uterus and transverse colon, resulting in a 36-day hospital stay to monitor for intra-abdominal hemorrhage. In our setting, postoperative methotrexate is not part of standard care for retained placenta. This is due to the relative insensitivity of mature placental tissue to methotrexate and the increased risk of complications, including necrotic tissue formation.[29] Moreover, methotrexate use in this context remains controversial due to potential adverse effects such as myelosuppression, hyperthermia, and intra-abdominal infection.[30,31] Eleven (64.7—11/17) cases had placentae implanted onto the external uterine wall, consistent with findings in the literature.[18]

Early ultrasound scan may miss the definitive diagnosis in 50% of cases.[32] In this series, the diagnosis was missed (82.4%—14/17) on the initial scan. All advanced abdominal pregnancies were diagnosed preoperatively in this case series, likely reflecting the tertiary hospital setting with access to ultrasound facilities and experienced ultrasonographers. This contrasts with findings in the majority of LMICs, where only 20% to 40% of cases are diagnosed before surgery.[24]

In this series, neonatal morbidity potentially related to the advanced abdominal pregnancy included growth restriction, cranial asymmetry and respiratory distress syndrome. A case report of a heterotopic pregnancy (an extrauterine and intrauterine pregnancy occurring simultaneously) demonstrated that the extrauterine pregnancy was 5 weeks behind in development and had absent fetal diastolic blood flow compared to the intrauterine pregnancy.[18]

Clinical implications

The findings highlight the need for a high index of suspicion and timely referral, especially from peripheral settings with limited access to antenatal ultrasound. Strengthening ultrasound services and improving access to experienced sonographers could enable earlier diagnosis and more effective management. In tertiary settings, anticipating complications—particularly massive hemorrhage—and ensuring appropriate preparation are essential to reducing associated morbidity.

This series highlights key diagnostic and therapeutic challenges in managing advanced abdominal pregnancy in LMIC settings. Missed diagnoses on initial ultrasound scans reflect both the operator-dependent nature of sonography and variable access to experienced ultrasonographers.

Research implications

A previous case series examining developmental outcomes of 4 live-born babies following advanced abdominal pregnancies reported that 2 of the 4 had reached adulthood with normal functioning.[33] Although this series demonstrated a high survival rate for live-born babies, no follow-up was conducted to assess their neurodevelopmental outcomes. Future research could focus on the neurodevelopmental trajectories of discharged babies to further evaluate long-term outcomes.

Strengths and limitations

As this was a retrospective folder review, data for all fields were not consistently available. Additionally, cases of advanced abdominal pregnancies that were either not documented or inaccurately recorded in the theatre book may have been inadvertently missed.

Conclusions

This is the first case series from a low- and middle-income country demonstrating favorable neonatal outcomes in abdominal pregnancy. Nonetheless, these outcomes were achieved in a well-resourced tertiary setting, and the findings support the need for improved antenatal diagnostic services, high clinical suspicion, and timely referral to enhance both maternal and neonatal survival. ■

CRediT authorship contribution statement

Shannon Harries: Data curation, Formal analysis, Project administration, Visualization, Writing – original draft, Writing – review & editing. **Lloyd Tooke:** Conceptualization, Methodology, Supervision, Validation, Writing – review & editing. **Jean-Christophe Imbeault:** Data curation, Visualization, Writing – original draft. **Mushi Matjila:** Conceptualization, Supervision, Validation, Writing – review & editing. **Shakti Pillay:** Conceptualization, Data curation, Formal analysis, Methodology, Project administration, Visualization, Writing – review & editing. ■

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