

Fetal and Neonatal Outcomes of Antenatally Detected Ductus Arteriosus Aneurysm: A Retrospective Observational Study

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ABSTRACT

OBJECTIVE: Ductus arteriosus aneurysm (DAA) is a rare fetal cardiac anomaly characterized by abnormal dilation of the ductus arteriosus. While many cases resolve spontaneously, DAA can be associated with complications such as thromboembolism, rupture, or persistent patent ductus arteriosus (PDA). The increasing use of fetal echocardiography has improved early diagnosis, but the clinical significance and outcomes of antenatally diagnosed DAA remain incompletely understood. This study aims to analyze the prevalence, echocardiographic characteristics, and postnatal outcomes of antenatally diagnosed DAA, as well as evaluate the association between DAA size, maternal and neonatal factors, and postnatal PDA persistence.

STUDY DESIGN: This retrospective observational study was conducted at a tertiary care perinatal center in South India from 2011 to the present. All third-trimester fetuses diagnosed with DAA via ultrasound were included. Data on maternal and neonatal characteristics, postnatal echocardiographic findings, and perinatal outcomes were collected and analyzed. Statistical analysis was performed using SPSS version 26, with significance set at $p < 0.05$.

RESULTS: A total of 35 fetuses were diagnosed with DAA. The mean maternal age was 26.32 ± 9.33 years, and the mean gestational age at delivery was 34.34 ± 3.58 weeks. Spontaneous resolution of DAA occurred in 62.85% of cases, while 17.14% had juxta-ductal coarctation with moderate PDA, 11.42% had DAA with an organized thrombus, and 8.57% had a large ductal aneurysm with a small PDA. Larger DAA size was significantly associated with persistent PDA ($p = 0.009$). Lower gestational age was also a significant predictor of PDA persistence ($p = 0.03$), whereas birth weight and maternal age showed no significant associations.

CONCLUSION: The majority of antenatally diagnosed DAA cases resolve spontaneously, but larger aneurysms and lower gestational age are associated with persistent PDA. These findings highlight the importance of prenatal and postnatal echocardiographic surveillance for risk stratification and management. A conservative yet vigilant approach is recommended to optimize neonatal outcomes.

Keywords: Antenatal detection; Ductus arteriosus aneurysm; Fetal outcome; Neonatal outcome

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Introduction

Ductus arteriosus aneurysm (DAA) is a rare but clinically significant fetal cardiac anomaly characterized by the abnormal dilation of the ductus arteriosus (1). The ductus arteriosus plays a critical role in fetal circulation by shunting blood from the pulmonary artery to the aorta, bypassing the non-functioning fetal lungs. Under normal circumstances, the ductus arteriosus undergoes physiological closure soon after birth (1,2). The pathophysiology of ductus arteriosus aneurysm (DAA) involves localized weakness or structural abnormality of the ductal wall intimal cushion, possibly related to abnormal elastin and collagen composition, absent or decreased fibronectin, altered flow dynamics, or delayed functional closure, leading to focal dilation during the perinatal transition. However, aneurysmal dilation of this structure poses potential risks, including thromboembolism (3), spontaneous rupture, and compression of adjacent structures (4–6). The prenatal diagnosis of DAA has become increasingly feasible with ad-

vancements in fetal echocardiography, allowing for early identification and risk stratification of affected fetuses.

Although many cases of DAA resolve spontaneously without clinical consequences, some instances may be associated with significant complications, particularly when the aneurysm persists or is accompanied by a patent ductus arteriosus (PDA) postnatally. Several maternal and neonatal factors, including gestational age at birth (7) and birth weight (8), may affect the prognosis of DAA. Maternal health conditions may influence the prognosis of DAA and the likelihood of spontaneous closure. Given the potential clinical implications, it is essential to establish appropriate monitoring strategies to guide postnatal management and optimize neonatal outcomes (9).

This study aims to analyze the prevalence, echocardiographic characteristics, and postnatal outcomes of antenatally diagnosed DAA cases. Additionally, we seek to determine the association between DAA size, maternal and neonatal factors, and postnatal persistence of PDA. By evaluating these factors, our study provides insight into the natural history of DAA and informs clinical decision-making regarding postnatal surveillance and intervention strategies.

Material and Method

This retrospective observational study was conducted at a tertiary care perinatal centre in South India from January 2011 to March 2024 after obtaining Institutional Ethical Committee approval (EC Ref-No 50_2023, Dated:25-03-2024). The study included all cases of antenatally diagnosed DAA confirmed by fetal echocardiographic three-vessel tracheal view in the third trimester, and all affected neonates were evaluated in detail postnatally. Exclusion criteria are cases with incomplete medical records and cases with misdiagnosed cardiac anomalies.

Primary outcome measures are live birth, as defined by the International Classification of Diseases, 10th Revision (ICD-10), referring to an infant who breathes or shows any signs of life post-delivery, APGAR score at 1 and 5 minutes, and ges-

tational age at delivery. Secondary outcomes are the prevalence of DAA in the study cohort, thrombus formation within the DAA, associated cardiac and extra-cardiac abnormalities, requirement for postnatal intervention, neonatal intensive care unit (NICU) stay duration, and incidence of congestive cardiac failure.

Data were analyzed using SPSS software (version 26, IBM Corp., Armonk, NY, USA). Descriptive statistics were applied for demographic and clinical variables. A post-hoc precision analysis was conducted to assess the relationship between DAA size and clinical outcomes. Continuous variables were expressed as mean \pm standard deviation (SD), and categorical variables were presented as frequencies and percentages. Statistical significance was determined at a p-value $<$ 0.05.

This study was conducted in accordance with the principles of the Declaration of Helsinki. Owing to its retrospective design and use of anonymized patient data without direct patient contact, the requirement for written informed consent was waived by the institutional ethics committee.

Results

During the study period from January 2011 to December 2024, a total of 2,300 third-trimester fetal echocardiography scans were performed, of which 35 fetuses were diagnosed with DAA, giving an incidence of approximately 1.5% in this cohort.

The mean maternal age was 26.32 ± 9.33 years, and the mean gestational age at delivery was 34.34 ± 3.58 weeks. The most common mode of delivery was emergency lower segment caesarean section (LSCS) (45.71%), followed by spontaneous vaginal delivery (25.71%), assisted vaginal delivery with vacuum (17.14%), elective LSCS (8.57%), and induced labor (2.86%). The mean birth weight was $2,909.82 \pm 448.36$ grams. Male neonates comprised 60.0% of the cohort. Based on birth weight percentiles, 28.57% were small for gestational age (SGA), 33.33% appropriate for gestational age (AGA), and 21.40% large for gestational age (LGA) (Table I).

Table I: Maternal and neonatal characteristics

Variable	Mean \pm SD / Frequency (n)	Percentage (%)
Maternal age (years)	26.32 \pm 9.33	—
Gestational age (weeks)	34.34 \pm 3.58	—
Mode of delivery		
Emergency lower segment cesarean section (LSCS)	16	45.71%
Spontaneous vaginal delivery	9	25.71%
Assisted vaginal delivery (Vacuum)	6	17.14%
Elective C-Section	3	8.57%
Induced labor	1	2.86%
Birth weight (grams)	2909.82 \pm 448.36	—
Male neonates	21	60.00%
Female neonates	14	40.00%
Small for gestational age (SGA)	12	28.57%
Appropriate for gestational age (AGA)	14	33.33%
Large for gestational age (LGA)	9	21.40%

Mean \pm standard deviation (SD) for continuous variables and frequency (n) with percentage (%) for categorical variables

Postnatal echocardiographic follow-up demonstrated normal resolution of DAA in 62.85% of neonates. Other findings included DAA with organized thrombus and small PDA in 11.42%, moderate PDA in 17.14%, and large ductal aneurysm with small PDA in 8.57% (Table II). Other associated cardiac malformations detected were right aortic arch, bicuspid aortic valve with ASD, and juxta-ductal coarctation.

Analysis of aneurysm size revealed a statistically significant association between larger DAA size and persistence of PDA (mean difference 2.25 mm, $p=0.009$). Cases with normal resolution had a mean size difference of 1.67 mm ($p=0.03$), while spontaneous closure was not significantly associated with aneurysm size ($p=0.47$) (Table III).

Gestational age was also significantly correlated with PDA persistence ($p=0.03$), with lower gestational age linked to ongoing ductal patency. Birth weight and maternal age were not significantly associated with PDA outcomes ($p>0.05$) (Table IV). Interestingly, diabetes mellitus was observed in 8 mothers, supporting the notion that maternal metabolic disorders may influence ductal remodelling and predispose fetuses to DAA.

Discussion

DAA is increasingly detected in prenatal imaging, yet its true incidence remains underestimated. In this study, a total of

2,300 third-trimester fetal echocardiography scans were performed, of which 35 fetuses were diagnosed with DAA, giving an incidence of approximately 1.5% in this cohort, aligning with prior retrospective reports (5). They noted a 1.5% incidence of a “ductal bump” in newborns with respiratory distress, reinforcing the idea that many cases resolve spontaneously before postnatal imaging confirms them. The prevalence of DAA was notable in the study population, with a significant proportion of cases resolving spontaneously. The high spontaneous resolution rate (62.85%) aligns with previous findings that suggest the majority of DAAs regress without intervention (1). However, cases with associated thrombus formation or large aneurysmal dilation required close monitoring due to the risk of complications such as thromboembolism or persistent PDA.

The three-vessel trachea (3VT) view remains the gold standard for prenatal DAA diagnosis (10). In our cohort, 2D echocardiography and color Doppler effectively delineated aneurysmal dilation. Studies confirmed that fetal echocardiography is highly reliable in DAA detection (11), although in cases of large aneurysms with suspected thrombi, MRI or fetal CT angiography may be warranted (12).

Our findings show that 62.85% of DAA cases exhibited spontaneous resolution by the time of postnatal follow-up (1,13). However, a subset of cases had associated cardiac

Table II: Postnatal echocardiographic findings

Diagnosis	Frequency (n)	Percentage (%)
DAA with organized thrombus and small PDA	4	11.42%
Normal Resolution of DAA	22	62.85%
Juxta-ductal coarctation with moderate PDA	6	17.14%
Large ductal aneurysm with small PDA (1-Right aortic arch)	3	8.57%

DAA: Ductus arteriosus aneurysm; PDA: Patent ductus arteriosus. Percentages are calculated based on the total study cohort ($n = 35$)

Table III: Association between DAA size and postnatal outcomes

Postnatal Outcome	Mean Difference (mm)	Standard Error	p	95% CI
Normal Resolution of DAA	1.67	0.60	0.03	0.09 - 3.25
Spontaneous Closure DA	0.57	0.48	0.47	0.67 - 1.82
Persisting PDA	2.25	0.48	0.009	0.57 - 3.92

DA: Ductus Arteriosus; DAA: Ductus arteriosus aneurysm; PDA: Patent ductus arteriosus; CI: Confidence interval. Mean difference indicates the difference in DAA size between the specified outcome group and the overall mean. Statistically significant p -values (< 0.05) are shown in bold.

Table IV: Correlation between maternal and neonatal factors with PDA outcome

Variable	Normal Outcome (Mean \pm SE)	p	Spontaneous Closure (Mean \pm SE)	p	Persisting PDA (Mean \pm SE)	p
Gestational Age (weeks)	1.26 \pm 1.46	0.66	3.04 \pm 1.34	0.39	1.77 \pm 1.51	0.03*
Birth Weight (grams)	259.34 \pm 188.94	0.36	61.09 \pm 173.97	0.24	320.44 \pm 195.00	0.93
Maternal Age (years)	0.38 \pm 4.01	0.92	3.83 \pm 3.69	0.26	4.21 \pm 4.14	

PDA: Patent ductus arteriosus; SE: Standard error. Variables were compared between each outcome group and the overall cohort. A p -value < 0.05 was considered statistically significant.

anomalies, necessitating closer monitoring for Juxta-ductal coarctation with moderate PDA and bidirectional shunt (17.14%), large ductal aneurysm with small PDA (8.57%), and DAA with organized thrombus (11.42%) (14).

These findings align with previous studies that described thrombus formation between postnatal days 3–10, followed by spontaneous resolution within one month (3,5).

Larger DAA sizes were significantly associated with persistent PDA, supporting the hypothesis that aneurysmal dilation may impede normal ductal closure mechanisms. This finding underscores the importance of prenatal and postnatal echocardiographic surveillance in cases of larger DAAs to anticipate and manage potential complications (15).

The findings of this study are consistent with prior research that indicates a high rate of spontaneous resolution in antenatally diagnosed DAAs. Previous studies have reported spontaneous resolution rates ranging from 60% to 70%, which aligns closely with our observed rate of 62.85%. Studies have also highlighted that smaller DAAs tend to resolve without intervention, whereas larger DAAs, particularly those exceeding 2 mm in diameter, may have a higher likelihood of persisting PDA or associated complications (1).

Additionally, our study corroborates earlier reports that preterm neonates are at a greater risk for persistent PDA, likely due to immature vascular smooth muscle function. In a study, gestational age was identified as a critical determinant of ductal closure, supporting our findings (7).

Unlike some previous studies that have suggested an association between birth weight and PDA persistence, our findings did not reveal a statistically significant correlation (16). This discrepancy may be attributed to differences in sample sizes and population characteristics.

Given the high rate of spontaneous resolution, a conservative approach with routine postnatal echocardiographic monitoring may be appropriate for most cases (17). However, neonates with larger DAA sizes, associated cardiac anomalies, or signs of thrombus formation should be closely observed and managed accordingly.

In our cohort, short-term outcomes are favourable, with most cases showing spontaneous resolution or successful closure of the ductus without major complications, and no adverse events such as rupture were observed, although long-term data are limited. Future research should focus on long-term follow-up of affected neonates to assess potential late-onset cardiovascular complications.

Strengths and Limitations: Our findings reinforce the need for routine third-trimester fetal cardiac screening to improve early DAA detection and risk stratification. Further prospective studies are needed to define long-term neurodevelopmental

outcomes in neonates with antenatally detected DAA. Explore molecular pathways contributing to elastin dysregulation in DAA formation. Optimize management algorithms, balancing watchful waiting vs. early surgical intervention in large or thrombotic aneurysms.

Limitations: The retrospective design and modest sample size limit statistical power. The single tertiary-centre setting may affect generalizability due to potential referral bias. The absence of long-term follow-up data prevents assessment of potential late-onset complications.

Conclusion

This study highlights the significant proportion of DAA cases that resolve spontaneously, reinforcing the necessity for careful prenatal and postnatal monitoring rather than immediate intervention. Larger DAA sizes and lower gestational age at birth were associated with a higher likelihood of PDA persistence, emphasizing the need for targeted follow-up in these cases. While birth weight and maternal age did not exhibit strong correlations with PDA outcomes, further research is needed to clarify their potential roles. Overall, a conservative yet vigilant management approach is recommended, with emphasis on echocardiographic surveillance to guide clinical decision-making and optimize neonatal outcomes.

Declarations

Ethics approval and consent to participate: This study was conducted in accordance with the principles of the Declaration of Helsinki. Owing to its retrospective design and use of anonymized patient data without direct patient contact, the requirement for written informed consent was waived by the institutional ethics committee. The study was reviewed and approved by the ethics committee (Registration No: ECR/933/Inst/TG/2017) (Ethics approval reference number: EC Ref-No 50_2023, Dated:25-03-2024).

Availability of data and materials: The data supporting this study are available through the corresponding author upon reasonable request.

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Authors' Contributions: SR: Conceptualization, Formal Analysis, Investigation, Methodology, Project, Administration, Resources, Supervision, Validation, Visualization, Writing, Original Draft, Writing, Review and Editing. SM: Data Curation, Formal Analysis, Investigation, Methodology, Resources. GK: Project Administration, Validation. SV: Supervision

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References

1. Puder KS, Sherer DM, Ross RD, Silva ML, King ME, Treadwell MC, et al. Prenatal ultrasonographic diagnosis of ductus arteriosus aneurysm with spontaneous neonatal closure. *Ultrasound Obstet Gynecol.* 1995;5(5):342-5. Doi: 10.1046/j.1469-0705.1995.05050342.x. PMID: 7614141.
2. Şenol G. PP-03 Prenatal diagnosis of ductus arteriosus aneurysm. *Perinatal Journal.* 2023;31(2023):12-3. Doi: 10.59215/prn.031supp018
3. Inagi Y, Kitagawa A, Miyaji K, Takanashi M, Honda T, Okamura T, et al. Rapidly growing thrombus from a ductus arteriosus aneurysm in a neonate. *J Cardiol Cases.* 2022;26(4):283-5. Doi: 10.1016/j.jccase.2022.05.014. PMID: 36187314, PMCID: PMC9508576.
4. Ganesan S, Hutchinson DP, Sampson AJ. Prenatal diagnosis of ductus arteriosus aneurysm. *Ultrasound.* 2015;23(4):251-3. Doi: 10.1177/1742271X15587931. PMID: 27433265, PMCID: PMC4760603.
5. Dyamenahalli U, Smallhorn JF, Geva T, Fouron JC, Cairns P, Jutras L, et al. Isolated ductus arteriosus aneurysm in the fetus and infant: a multi-institutional experience. *J Am Coll Cardiol.* 2000;36(1):262-9. Doi: 10.1016/s0735-1097(00)00707-5. PMID: 10898444.
6. Brock J, Nussbaum E, Shows J, Nguyen S, Setty SP. An unusual cardiac cause of unilateral neonatal wheezing. *Case Rep Pediatr.* 2019;2019:9638518. Doi: 10.1155/2019/9638518. PMID: 31179149, PMCID: PMC6501233.
7. Backes CH, Hill KD, Shelton EL, Slaughter JL, Lewis TR, Weisz DE, et al. Patent ductus arteriosus: a contemporary perspective for the pediatric and adult cardiac care provider. *J Am Heart Assoc.* 2022;11(17):e025784. Doi: 10.1161/JAHA.122.025784. PMID: 36056734; PMCID, PMC9496432.
8. Mezu-Ndubuisi OJ, Agarwal G, Raghavan A, Pham JT, Ohler KH, Maheshwari A. Patent ductus arteriosus in premature neonates. *Drugs.* 2012;72(7):907-16. Doi: 10.2165/11632870-000000000-00000. PMID: 22564132, PMCID: PMC4432245.
9. Lund JT, Jensen MB, Hjelms E. Aneurysm of the ductus arteriosus. A review of the literature and the surgical implications. *Eur J Cardiothorac Surg.* 1991;5(11):566-70. Doi: 10.1016/1010-7940(91)90220-e. PMID: 1772665.
10. Yagel S, Arbel R, Anteby EY, Raveh D, Achiron R. The three vessels and trachea view (3VT) in fetal cardiac scanning. *Ultrasound Obstet Gynecol.* 2002;20(4):340-5. Doi: 10.1046/j.1469-0705.2002.00801.x. PMID: 12383314.
11. Oztunc F, Murt NU, Dedeoglu R, Coskun YI, Madazli R. Prenatal diagnosis of ductus arteriosus anomalies: a single-center study. *Pediatr Cardiol.* 2024;45(3):600-4. Doi: 10.1007/s00246-023-03359-8. PMID: 38099950.
12. Bannan B, Aly S, Yoo SJ, Seed M, Lam CZ. The many faces of neonatal ductus arteriosus aneurysms: multimodality imaging with an emphasis on CT and MRI appearance. *Radiol Cardiothorac Imaging.* 2021;3(3):e210017. Doi: 10.1148/ryct.2021210017. PMID: 34235446, PMCID: PMC8250417.
13. Parkerson S, Philip R, Talati A, Sathanandam S. Management of patent ductus arteriosus in premature infants in 2020. *Front Pediatr.* 2021;8:590578. Doi: 10.3389/fped.2020.590578. PMID: 33643964, PMCID: PMC7904697.
14. Awasthy N, Tomar M, Radhakrishnan S, Iyer KS. Constriction of juxta-ductal aorta and rapid progression of obstruction in a newborn. *Ann Pediatr Cardiol.* 2010;3(2):181-3. Doi: 10.4103/0974-2069.74054. PMID: 21234202, PMCID: PMC3017927.
15. Tseng JJ, Jan SL. Fetal echocardiographic diagnosis of isolated ductus arteriosus aneurysm: a longitudinal study from 32 weeks of gestation to term. *Ultrasound Obstet Gynecol.* 2005;26(1):50-6. Doi: 10.1002/uog.1859. PMID: 15926189.
16. Jan SL, Hwang B, Fu YC, Chai JW, Chi CS. Isolated neonatal ductus arteriosus aneurysm. *J Am Coll Cardiol.* 2002;39(2):342-7. Doi: 10.1016/s0735-1097(01)01736-3. PMID: 11788229.
17. Peiró Molina E, Sánchez Andrés A, Carrasco Moreno JJ. Aneurisma del ductus arterioso: diagnóstico prenatal y evolución [Ductus arteriosus aneurysm: Prenatal diagnosis and outcome]. *An Pediatr (Barc).* 2017;87(6):359-361. Spanish. Doi: 10.1016/j.anpedi.2016.10.007. PMID:28108133.